Appendices to the 2015 update to the river basin management plan for the Solway Tweed river basin district

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Section A: Appendices combining English and Scottish information

Appendix 1: Protected areas

Introduction

There are many areas where the water environment is especially valued. These areas include rare wildlife habitats, bathing waters and areas where drinking water is abstracted. These areas are known as 'protected areas' and their uses are given particular legal protection. Protected areas are a priority for action to make sure they achieve their objectives and protect the benefits they provide.

This section presents information on the extent that protected areas are compliant with their current standards and objectives.

Table A1.1 summarises the types and numbers of protected areas in the Solway Tweed river basin district. Further information on their location is available in the **Water environment hub**.

Table A1.1 – Summary of protected areas in the Solway Tweed river basin district

Type of protected area as defined by the Water Framework Directive	Protected area name used in this plan
Areas designated for the abstraction of water intended for human consumption.	Drinking Water Protected Area (DWPA)
Areas introduced to protect designated waters from pollution in order to support shellfish life and growth.	Shellfish waters
Bodies of surface water designated as bathing waters.	Bathing waters
Areas designated as nutrient sensitive areas.	Nitrate vulnerable zone (NVZ)
	Urban Waste Water Treatment Directive (UWWTD) sensitive area
Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection.	Special Area of Conservation (SAC)
	Special Protection Area (SPA)
Areas designated to protect and enhance the marine environment.	Marine Protected Area

Current condition and objectives for protected areas in the English part of the Solway Tweed

Drinking water protected areas

The objectives for drinking water protected areas are to ensure that:

- under the water treatment regime applied, the drinking water produced meets the standards of the Drinking Water Directive plus any UK requirements to make sure that drinking water is safe to drink;
- the necessary protection is in place to prevent deterioration in the water quality in the protected area in order to reduce the level of purification treatment required.

These objectives are at risk when increasing pollution levels caused by human activity could lead to more treatment being needed in the future and where measures are needed to reduce pollution. Safeguard zones are non-statutory areas identified for 'at risk' abstractions where land use management practices and other activities can affect the quality of the untreated water. Measures to prevent and reduce pollution are targeted within these zones.

Table A1.2: Drinking water protected areas current status and at risk

Water body type	Number of drinking water protected areas	% at risk (surface water) / % at poor status (groundwater)
Surface water	7	100
Groundwater	5	40

Shellfish waters

Some areas of estuarine and coastal waters are designated as shellfish waters. Shellfish waters are areas requiring protection or improvement to support shellfish life and growth in order to contribute to the high quality of shellfish for people to eat.

Table A1.3: Shellfish water protected areas current status and objectives

Number of shellfish waters	Objective	Current status 2015 (achieving compliance)	Achieving objective by 2021	Achieving objective by 2027
2	Endeavour to achieve the shellfish flesh guideline standard	0	1	1

Note to Table A1.3: Shellfish waters were unmonitored during 2014 due to the absence of commercial harvesting activity

Bathing waters

Bathing waters are designated beaches that large numbers of bathers use. The objective for bathing waters is to preserve, protect and improve the quality of the environment and to protect human health by meeting

the ‘sufficient’ water quality standards of the Bathing Waters Directive, and to take such realistic and proportionate measures considered appropriate with a view to increasing the number of bathing waters classified as ‘excellent’ or ‘good’.

Table A1.4: Bathing water protected areas current status and objectives

Number of bathing waters	Objective	Number that met at least the sufficient classification in 2014*	Number we expect to achieve at least sufficient in 2015	Number at risk of not achieving sufficient in 2015
2	At least sufficient classification	0	0	2

* This is the number that would have met at least the sufficient class if the new 2015 standards had been in force

Nitrate vulnerable zones

The objective of the Nitrates Directive is to reduce and prevent further water pollution caused by nitrates from agricultural sources. Nitrate vulnerable zones (NVZs) are designated where surface and groundwater need protecting because they are vulnerable to nitrate pollution. Farms within NVZs must comply with action programmes to reduce agricultural nitrate losses. There is also a code of good agricultural practice for all farmers.

Table A1.5: Nitrate vulnerable zone protected areas extent

Reason for designation	Number of NVZs	Land area (ha) covered by NVZ type	% of RBD area coverage by NVZ type
High nitrate in surface water	7	12,897	1%
High nitrate in groundwater	5	21,500	1%
Eutrophication in lakes or reservoirs	0	-	0%
Eutrophication in estuaries or coastal waters	0	-	0%

Urban Waste Water Treatment Directive

The objective of the Urban Waste Water Treatment Directive is to protect the environment from the adverse effects of waste water discharges. Sensitive areas are designated for water bodies affected by eutrophication or where surface water abstraction is affected by elevated nitrate concentrations. Reductions or emission standards for nutrients in sewage effluent must be met within areas sensitive to nutrient pollution.

Table A1.6: Urban Waste Water Treatment Directive protected areas current status and objectives

Reason for designation	Number of sensitive areas	Length (km) / Area (km2) designated
Eutrophication in rivers	1	15
Eutrophication in canals	N/A	N/A
Eutrophication in lakes / reservoirs	N/A	N/A
Eutrophication in estuaries or coastal waters	N/A	N/A
High nitrate in surface fresh water	N/A	N/A

Natura 2000 sites: Water dependent Special Areas of Conservation or Special Protection Areas

The overall objective of the Habitats Directive is to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of community importance. The network of protected areas established under the Wild Birds and Habitats Directives is known as Natura 2000. Site conservation objectives are designed to maintain or restore Natura 2000 sites to favourable condition. The provisions of the WFD only relate to water dependent Natura 2000 sites or water dependent habitats and species on sites that combine wet and dry features. The objective is to protect and, where necessary, improve the water environment to achieve favourable condition for the water dependent features that the site was designated as set out in the site's conservation objectives.

Natural England determines what favourable condition means in terms of the environmental conditions (targets) and ecology expected for designated habitats and species. The targets required are based on UK Common Standards Monitoring Guidance (CSMG), published by the Joint Nature Conservation Committee. Some of the conservation objectives for attributes of Natura 2000 sites are the same or equivalent to objectives for elements of water bodies. Natural England monitors compliance with these objectives. Where there are CSMG targets for flow and water quality elements, they have been taken into account when setting water body status objectives. Where the deadline for achieving Natura 2000 water body objectives (CSMG target) has been extended beyond 2021, the Environment Agency has agreed interim goals locally with Natural England.

Ramsar sites are wetland sites of international importance. For the purposes of river basin management planning, Ramsar sites are considered in the same way as Natura 2000 sites.

Table A1.7 contains a summary of the current condition and objectives for Natura 2000 protected areas.

Table A1.7: Natura 2000 water protected areas current condition and objectives

Current condition **Area of SSSI underpinning Natura 2000 sites (Ha)**			
WFD - favourable			17,933
WFD - unfavourable recovering			6,536
WFD - unfavourable no change			926
WFD - unfavourable declining			187
WFD - destroyed/partially destroyed			0
Total areas			25,582
Objective	**Number of protected areas**		
	By 2015	**By 2021**	**By 2027**
All measures complete to enable conservation objectives to be achieved	3	1	6

Further information about the English protected areas:

- You can find a summary of the protected area action planning process and links to action plans for each protected area in Section 3.1.2 of the Part 2: RBMP overview (https://www.gov.uk/government/collections/river-basin-management-plan-update.
- For more information on the current condition of protected areas see section 4.2 of the Part 2: RBMP overview (https://www.gov.uk/government/collections/river-basin-management-plan-update).
- For a list of all the protected areas, associated objectives and information see the register of protected areas (https://ea.sharefile.com/d-s487ae61bf2a4b4fb).
- You can find detailed interactive maps of the different protected areas in the river basin district showing location, current status and monitoring points on the Environment Agency's ShareFile service (https://ea.sharefile.com/d-s9546a39bc1f4d778).

Supporting information:

- The CSMG and interim progress goals for flow and water quality elements in Natura 2000 are available on the Environment Agency's ShareFile service (https://ea.sharefile.com/d-s9546a39bc1f4d778).

Current condition and objectives for protected areas in the Scottish part of the Solway Tweed

Drinking Water Protected Areas

Drinking Water Protected Areas (DWPAs) are identified under *The Solway Tweed River Basin District (Status) (Scotland) Directions 2014*.[1] Their locations and associated monitoring sites can be found on the **Water environment hub**.

Our objective[2] is to prevent deterioration in quality of drinking water protected areas. Measures have been introduced or planned to protect the quality of the water abstracted or intended to be abstracted from them. These measures are summarised in Table A1.8.

Table A1.8: Measures to prevent significant deterioration in quality of water in DWPAs

Regulatory measures, including the requirements for point source discharges and for agricultural and forestry operations that may cause diffuse source pollution.
Targeted action to reduce diffuse source pollution in priority catchments and focus areas.
Targeted action to protect drinking water under Scottish Water's Sustainable Land Management Incentive Scheme.
Action programmes established for Nitrate vulnerable Zones under the Nitrates Directive.
Restrictions on marketing and use of pesticides under the Plant Protection Products Directive and the Biocides Directive.

Shellfish waters

Protected areas for economically important shellfish waters are designated to support the need for clean water in shellfish production areas and ensure a good quality product that is safe for human consumption.

The Scottish Government consultation digest on the next steps in implementing an integrated approach to the protection of shellfish growing water identified that Loch Ryan would be designated as a shellfish water protected area under appropriate legislation. This is currently under development[3].

Bathing waters

Areas protected for bathing are designated under the revised Bathing Waters Directive[4] and the Bathing Waters (Scotland) Amendment Regulations 2012.[5] The locations of the designated bathing waters and associated monitoring sites can be found on the **Water environment hub**. Monitoring and assessment are carried out by the Scottish Environment Protection Agency (SEPA) throughout the bathing season.

[1] http://www.gov.scot/Resource/0045/00457870.pdf
[2] Set out in Schedule 5 of the 2014 Status Directions
[3] http://www.gov.scot/Publications/2013/11/2843/2
[4] The Bathing Waters Directive (76/160/EEC) was replaced by the revised Bathing Water Directive (2006/7/EC). The revised Bathing Water Directive changes the parameters and standards used to assess bathing water quality as well as the timeframe over which the assessment is made.
[5] http://www.legislation.gov.uk/ssi/2012/243/contents/made

The revised Directive requires that bathing waters achieve a classification of at least 'sufficient' by the end of the 2015 bathing season. In addition, it is expected that realistic and proportionate measures will be taken to increase the number of areas protected for bathing waters classified as 'excellent' or 'good'. The main measures that will contribute towards maintaining and improving bathing water quality are those aimed at addressing rural and urban sources of pollution, summarised in Table A1.9.

Table A1.9: Measures to protect bathing water protected areas

Reduce diffuse source pollution through actions in priority catchments and focus areas.
Improve the quality of waste water discharges through Scottish Water's Q&S programme.
Understand the main sources of urban diffuse pollution, and reduce pollution at source.

Nitrate vulnerable zones

Nitrate vulnerable zones (NVZs) are designated under the Nitrates Directive[6], the purpose of which is to reduce or prevent water pollution caused or induced by nitrates from agricultural sources. There are two NVZs in the Scottish part of the Solway Tweed river basin district[7]**.** Their locations and associated surface and ground water monitoring sites can be found in the **Water environment hub.**

An action programme[8] is in place for all of Scotland's nitrate vulnerable zones, aiming to reduce pollution of vulnerable groundwater and estuaries by agricultural nitrates. These action programmes, and river basin planning measures for reducing rural diffuse pollution, are expected to reduce water pollution caused or induced by nitrates from agricultural sources, and to prevent further such pollution.

Urban Waste Water Treatment Directive sensitive areas

The Urban Waste Water Treatment Directive (UWWTD) identifies and designates sensitive areas[9] that require protection from the adverse effects of untreated urban waste water. The locations of the 24 current UWWTD sensitive areas and associated monitoring sites can be found in the **Water environment hub.**

Our objective for these areas is to meet the objectives of the Directive, through measures that ensure that relevant discharges are subject to the appropriate level of treatment. This will be delivered through our measures to reduce the impacts of waste water disposal.

Natura 2000 sites: Water dependent Special Areas of Conservation or Special Protection Areas

Natura 2000 is a European network of protected sites that represent areas of the highest value for natural habitats and species of plants and animals that are rare, endangered or vulnerable in the European Community. The Natura network includes two types of site:

[6] Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources

[7] A further NVZ - Stranraer Lowlands - is in the process of being designated which should take force in early 2016.

[8] http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/Environment/NVZintro

[9] UWWTD sensitive areas are surface water bodies identified as eutrophic or that may become eutrophic if protective action is not taken; intended for the abstraction of drinking water and that could contain elevated levels of nitrate (>50mg/l) if action is not taken; areas where further treatment is required to comply with other directives.

- Special Areas of Conservation (SACs) designated under the Habitats Directive[10];
- Special Protection Areas (SPAs) designated under the Birds Directive[11].

For these areas, we are required to protect and, where necessary, improve the status of the water environment in order to achieve the conservation objectives that have been established for the site.

These sites are assessed by Scottish Natural Heritage's site condition monitoring process, and the objective is that they should be in 'favourable' or 'unfavourable recovering' condition.

The measures in the Scottish part of the Solway Tweed river basin management plan will contribute to achieving good status water quality in protected areas for wildlife of international conservation importance. This will require measures to:

- improve water quality;
- restore physical condition and fish access;
- improve flows and levels;
- reduce the spread of invasive non-native species.

More information on objectives and measures for specific sites is available in the **Water environment hub.**

Marine Protected Areas

The Marine (Scotland) Act 2010 introduced a duty to protect and enhance the marine environment and includes measures on marine planning, marine licensing and marine conservation. By July 2014, 30 new Marine Protected Areas had been designated across Scotland, one (Clyde sea sill) is in the Solway Tweed inshore waters. Further information on these areas is available at www.gov.scot/Topics/marine/marine-environment/mpanetwork, and those located within Scottish coastal waters are shown in the **Water environment hub.**

Suitable management measures must be implemented at each site to conserve the protected features. These measures are being developed through consultation. More information is available at www.gov.scot/Topics/marine/marine-environment/mpanetwork/MPAMGT/protectedareasmgt.

In some cases, marine protected areas overlap with Special Areas of Conservation designated under the Habitats Directive. The management measures for these sites have also been reviewed alongside the consultation on management of marine protected areas.

The river basin planning measures to protect and improve coastal waters will help to deliver marine protected area objectives, by protecting and restoring marine habitat functions and processes.

[10] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of fauna and flora. Requires the identification and protection of sites that support rare, endangered or vulnerable natural habitats and species of plants and animals (other than birds).

[11] Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds. Requires the identification and protection of the most suitable territories, in size and number, for certain rare or vulnerable bird species and for regularly-occurring migratory bird species.

Appendix 2: Looking back – changes from 2009 to 2015

England

This section contains an assessment of what has been achieved and what has happened since the first river basin management plan was published in 2009.

It includes a summary of the improvements made to the evidence used in river basin management planning, a report on the implementation of measures, and a summary of progress towards achieving the environmental objectives in the 2009 plan.

Improvements in evidence

Over the last six years much has been done to improve the understanding of the water environment. The quantity and quality of the evidence available has grown because of significant investment.

- In England, an additional £4.7 million pounds has been invested in a new ecological monitoring programme for rivers and an additional £1.5 million pounds invested in chemical monitoring technology. This means that the number of classification element results in the river basin district has increased from 1,256 in 2009 to 1,675 in 2015.

- In the river basin district, investigations have been carried out to identify the reasons (pressures, and the sources of the pressures) why good status and protected area objectives have not been achieved.

- The actions that would be needed to achieve good status and protected area objectives have been identified.

- Through detailed economic appraisal, there is an improved understanding of the benefits the water environment can provide and the cost of the measures needed to realise the benefits.

- The latest generation of environmental assessment criteria has been introduced in collaboration with a range of partners and leading scientists. These improvements to methods mean that the classification results are now a better interpretation of the general health of the water environment. These changes include:
    - new standards for additional chemical substances;
    - updated standards for existing physico-chemical elements;
    - new and improved biological assessment tools and new intercalibrated biological classification boundary values.

- Improvements have been made in mapping of the water body network.

- Improved risk assessments have been introduced to help target future monitoring programmes, and predict and help prevent potential deterioration in the water environment.

This new evidence was used in the review and update of the environmental objectives in the 2009 plan.

Measures implemented

Planned measures implemented since 2009

Most of the measures (over 99%) summarised in the 2009 plans have been completed.
Two measures have not been completed because funding was withdrawn.

Additional measures implemented since 2009

As well as the measures in the 2009 plans, a significant number of other measures have been implemented. For instance in England, the government provided £90 million between 2010 and 2015 for additional measures to improve the physical water environment, reduce pollution, and reduce the impact of invasive non-native species.

It is not possible to identify all the additional measures across the whole river basin district. However, it is estimated that they represent an additional investment of £1.6 million. Table A2.1 gives a summary of the issues addressed and an indication of the scale of additional measures.

Table A2.1 – Summary of additional measures in the river basin district

Significant water management issue	Number of Measures	Cost (£million)	Number of water bodies affected
Physical modifications	12	1.1	46
Pollution from rural areas	5	0.5	31
Pollution from town, cities and transport	0	0.0	0
Pollution from abandoned mines	0	0.0	0
Non-native invasive species	3	0.0	6
Other	2	0.0	2
Total	**22**	**1.6**	**85**

Effectiveness of measures implemented since 2009

Most of the measures implemented between 2009 and 2015 have resulted in improvements to the quality of the water environment, providing significant additional benefits. However, the scale of the improvements has not always been enough to fully secure compliance with the Water Framework Directive (WFD) environmental objectives (protected area and water body status objectives) in the 2009 plan. Some of the reasons for this are identified below.

Table A2.2 contains a summary of how effective the measures implemented since 2009 were at achieving WFD environmental objectives. Measures are grouped by each significant water management issue. The assessment is based on the measures implemented across England and not just in this river basin district.

Table A2.2: Summary assessment of the effectiveness of measures for each significant water management issue (England level assessment)

Physical modifications
Obstructions Removing or lowering weirs and building fish passes has generally been effective. In some cases, it has not been possible to fully remove the pressure because of the obstruction's historic value or the need to prevent erosion or mobilisation of contaminated sediments. In some cases full compliance with WFD environmental objectives has not yet been achieved because other barriers elsewhere in the catchment are still present.
Habitat improvement Habitat improvements, from large-scale river restoration to relatively minor schemes on small watercourses, have generally been effective. They have led to improvements in fish populations and other wildlife. The effectiveness of these schemes at achieving compliance with WFD environmental objectives will only become apparent once the new habitat and associated wildlife has matured. In some cases, it is expected that additional restoration elsewhere in the catchment will be required to support a fully functioning ecosystem.
Pollution from waste water
There were over 300 improvement schemes implemented at sewage treatment works since 2009. These have been effective at helping to achieve compliance with WFD environmental objectives.
Pollution from rural areas
Government advice Catchment Sensitive Farming was effective at encouraging farmers to take up measures to help achieve WFD environmental objectives (mainly for protected areas). In areas where Catchment Sensitive Farming was targeted, between 2006 and 2013, the estimated quantity of pollutant (including phosphorus, nitrate, sediment and faecal indicator organisms) released from agricultural sources reduced by between 4% and 12% (on average).
Regulation Regulation has reduced the impact of pollution incidents and helped to prevent deterioration. There is some evidence that action plans for nitrate vulnerable zones helped to reduce pollution from nutrients. The overall effectiveness can only be assessed over a longer period.
Industry initiatives A number of schemes have promoted voluntary action including, advice and grants through local catchment groups, advice through the Campaign for the Farmed Environment, and work lead by water companies to improve the quality of water they abstract for public water supply. Advice is effective at promoting good farming practice. Measures that go beyond good practice greatly increase where grants have been provided. Many of these schemes resulted in improvements to the local water environment.
Environmental stewardship (2006 to 2014) There was good uptake of measures to protect the water environment. Measures were not always placed where most benefit could be gained or the uptake sufficiently concentrated within a catchment to reduce pressures enough to achieve compliance with WFD environmental objectives.

Cross compliance Compliance with environmental conditions attached to the Single Farm Payment was high. The environmental conditions were strengthened in 2010 and 2015. The associated measures had a small impact on the quality of the water environment
Changes to the natural flow and level of water
Changes in abstraction licences The Restoring Sustainable Abstraction programme has been effective at improving habitat for fish and other wildlife. Voluntary action resulted in changes to 145 abstraction licences and compulsory action (by the Environment Agency and government) resulted in changes to a further 55 abstraction licences. 27 billion litres of water has been returned to the environment. Permission to abstract a further 167 billion litres has been removed to prevent the risk of deterioration. This programme has been effective at helping to achieve compliance with WFD environmental objectives, in particular those for Natura 2000 protected areas.
Demand management Demand management and water efficiency techniques have been implemented by many sectors including government, water industry, independent bodies and trade associations. Local Development Plans/Frameworks have been introduced which set out local plan policies requiring new homes to meet the tighter water efficiency standard of 110 litres per person per day as described in Part G of Schedule 1 to the Building Regulations 2010. Water companies have reduced leakage from their supply networks and increased the number of homes with meters across water stressed areas. Most of these have been effective at a local scale.
Pollution from towns, cities and transport
A variety of measures have been implemented to reduce pollution from urban areas. These include: contaminated land restoration; installation of sustainable drainage systems for new and existing developments; treatments to remediate road run-off; regulatory action following pollution incidents; initiatives to resolve misconnected foul drainage systems; and pollution prevention advice to occupiers of industrial estates. Most of these measures have been effective at the local scale. However, in some cases the effectiveness is low, as there needs to be more measures within an area if improvements are to be sustained over the long term. Given the scale, cost and complexity of this issue, the measures have not been effective at reducing the pressure enough to achieve compliance with WFD environmental objectives.
Non-native invasive species
A variety of measures have been implemented to prevent the introduction and spread of non-native invasive species. These have been moderately effective and have slowed the deterioration of affected waters and the spread to unaffected waters. However, measures to remove this pressure from already affected water and achieve compliance with WFD environmental objectives have not been effective. This is now considered to be technically infeasible in most cases.

Progress towards achieving the environmental objectives in the 2009 plan

Preventing deterioration

To assess compliance with the WFD objective of preventing deterioration, 2015 classifications results (based on data up to the end of 2014) using the standards and classification tools used in 2009, were compared with the 2009 classification baseline. The assessment considered whether the water body had deteriorated

from one status class in 2009 to a lower one in 2015. This was applied to a water body's overall status and to the status of each element used in classification. The results of this assessment are summarised in Table A2.3.

Table A2.3: Surface water bodies that have deteriorated (at >75% confidence)

Water bodies	Number	Percentage
Surface water ecological status	6	4%
Surface water chemical status	0	0%
Groundwater quantitative status	0	0%
Groundwater chemical status	0	0%

Where deterioration of status has occurred, the cause needs to be identified and measures to restore the water body to its previous status put in place as soon as possible.

In some cases, reported deterioration may be a result of changes to monitoring programmes or be an artefact of monitoring and assessment processes (sampling error). Distinguishing these changes from real deterioration in the quality of the environment that has been caused by a new activity or a change in an existing pressure in a catchment can be difficult.

Table A2.4 contains a summary of the causes of deterioration that have already been identified. This summary is for each element by pressure and sector.

In certain and specific circumstances deterioration of status is permitted. These circumstances are described in Article 4.6 (temporary deterioration) and Article 4.7 (new modifications) of the WFD. No cases that meet these requirements have been identified in this river basin district.

Table A2.4: The reasons for deterioration from one or more status class and the sectors identified as contributing to the impact in the Solway Tweed river basin district

Pressure causing deterioration	Agriculture and rural land management	Industry	Mining and quarrying	Navigation	Urban and transport	Water Industry	Local and central government	Domestic general public	Recreation	Waste treatment and disposal	Other	No sector responsible	Sector under investigation	Total
Abstraction and Flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemicals	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biochemical oxygen demand	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dissolved Oxygen	2	0	0	0	0	1	0	0	0	1	0	0	0	4
Ammonia	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Fine sediment	4	0	0	0	0	0	0	0	0	0	0	1	0	5
Invasive non-native species	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrate	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Phosphate	1	0	0	0	0	0	0	0	0	0	1	0	0	2
Physical Modification	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Protected area objectives

Drinking water protected areas
The Drinking Water Inspectorate is the competent authority for the drinking water directive. They publish an annual report detailing compliance with the directive's water quality requirements.

The Environment Agency has established safeguard zones and produced associated actions plans for all relevant drinking water protected areas to manage the risk of water quality deteriorating.

Economically significant species (freshwater fish)
The Freshwater Fish Directive was repealed in December 2013. Environmental objectives for freshwater fish protected areas ceased to have effect from that date. An equivalent level of protection is provided by the water body objectives in this plan.

Economically significant species (shellfish waters)
The Shellfish Water Directive was repealed in December 2013. Shellfish water protected areas have been maintained and an equivalent level of protection provided by domestic legislation. Monitoring used to assess compliance with guideline shellfish flesh standards has significantly increased. Although there has been no significant change in the quality of the water environment in the protected areas, the improved monitoring has led to a reduction in reported compliance.

Current compliance with guideline shellfish flesh standard is summarised in table A1.3 in Appendix 1.

Recreational waters (bathing waters)
A revised bathing water directive introduced new water quality objectives for bathing water protected areas from 2015. Projected classification of bathing waters against the new standards is summarised in table A1.4 in Appendix 1. Compliance with the water quality standards of the old bathing water directive was assessed for the final time in 2014. These results are summarised in Table A2.5. This shows an increase in compliance since 2009.

Table A2.5: Bathing water compliance with old (1976) Bathing Water Directive objectives

Year	Number of bathing waters	% compliant with imperative standards	% compliant with guideline standards
2009	3	100	0
2014	2	100	0

Natura 2000 sites: Water dependent Special Areas of Conservation or Special Protection Areas
Seventeen Natura 2000 water dependent protected areas in the river basin district had an objective of achieving their conservation objectives of favourable status by 2015. Of these five achieved their objective.

Water body status objectives

As a result of the improvements in monitoring, standards and classification tools it is not possible to identify environmental change by simply comparing the 2009 and 2015 classification baselines. Instead, a set of 2015 classifications results (based on data up to the end of 2014) has been produced using the standards and classification tools used in 2009.

Table A2.6 shows the percentage of water bodies at good status for the:

- 2009 baseline;
- predicted outcomes in 2015 envisaged in the 2009 plans;
- 2015 classification results produced using the 2009 methods.

Table A2.6: Comparison of 2009 baseline with 2015 predicted and actual results (using the standards and classification tools used in 2009)

Percentage of water bodies at good or better status	2009	2015 predicted	2015 actual
Surface water ecological status	45%	53%	42%
Surface water chemical status	3%	3%	19%
Groundwater quantitative status	80%	80%	80%
Groundwater chemical status	60%	60%	60%
Overall status	45%	52%	43%

Although many of the measures completed over the last six years are providing benefits for the local environment, there has been a slight reduction in the number of water bodies at good status. However, during that period 109 water body elements improved by one or more class.

There may be several reasons why the predicted improvement in status has not yet been seen.

These include:

- the measures have not been as effective at reducing pressures at the water body scale as expected;
- the environmental standards which the measures were designed to achieve were not tight enough to fully protect the biological elements;
- there are pressures acting on the water bodies that were not known in 2009;
- improvements in the monitoring network to better detect the pressures;
- the pressure has been reduced but the biology has yet to fully improve;
- some classification elements have improved in status, but no improvement in the status of the water body has been reported due to the use of the 'one out all out' classification rule.

Scotland

This appendix provides our assessment of the progress that we made during the period 2009 to 2015 towards the achievement of the environmental objectives we established in the first river basin management plan in 2009.

To identify the progress made, we undertook a detailed analysis of our information about each water body, including the results of monitoring programmes. We needed to make the assessment on the basis of such an analysis because we could not rely on simply comparing the assessment of the condition of the water environment published in the first plan in 2009 with that undertaken for this plan. Over the intervening period we have:

- collected much more information about the water bodies in the district;
- developed and refined the methods and environmental standards we use to interpret data and make our assessments;
- refined the boundaries of bodies of groundwater and surface water - including splitting some into more than one body - to reflect our improving understanding of how the condition of the water environment varies from place to place.

The resulting improvements in our understanding account for a significant proportion of the difference between our 2009 and 2015 assessments.

Progress in improving the condition of water bodies

In that first plan, we set out to improve the condition of 51 bodies of surface water and one body of groundwater by 2015.

Progress in improving the condition of bodies of surface water

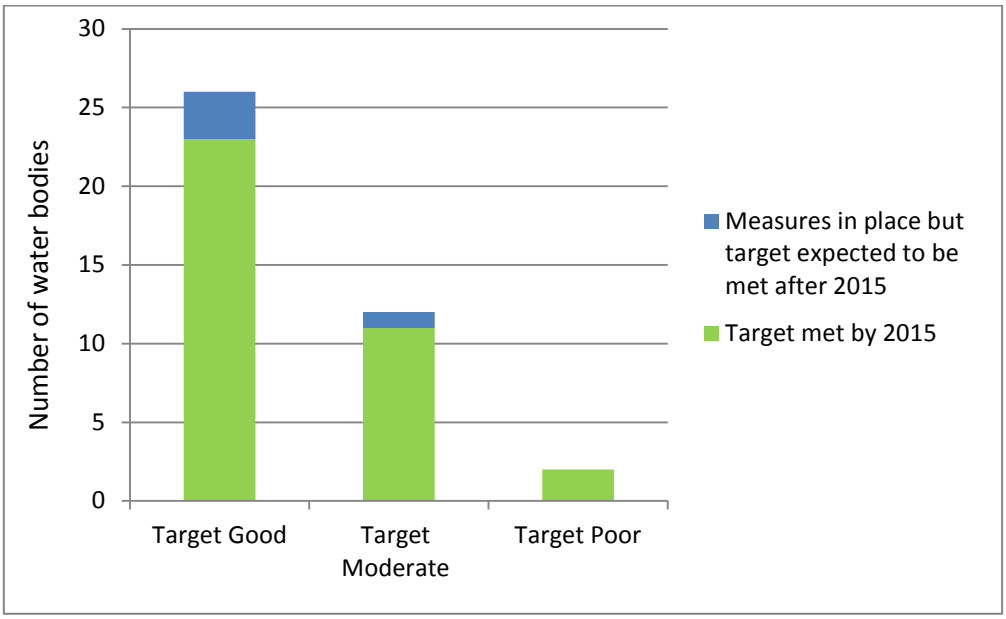
The progress we made in improving bodies of surface water is summarised in Table A2.7 and Figure A2.1.

Table A2.7: Progress in improving the condition of bodies of surface water during the period 2009 to 2015

Progress by 2015	Number of water bodies
Improvement target reached	36
Measures completed but natural recovery processes mean that the objective will be achieved after 2015	4

Note to table A2.1: Improvements planned for seven bodies of surface water were substituted by improvements to an equivalent number of other water bodies to reflect our changing understanding of priorities. Improvements to the former have been re-prioritised for action in the period 2015 to 2027.

Figure A2.1 Progress in improving the condition of rivers, lochs, estuaries and coastal waters during the period 2009 to 2015



Over the period 2009 to 2015, our targets have been met in, or the actions necessary to meet them completed for, 40 surface water bodies, 11 fewer than originally planned. Table A2.8 outlines the reasons we did not achieve our targets in those water bodies.

Table A2.8: Reasons why improvement targets for the condition of water bodies were not achieved

Reason improvement targets were not achieved	Overview	Interim action taken	Number of water bodies
It proved infeasible to complete the necessary actions and achieve the improvement target by 2015 for 11 water bodies.	We overestimated the scale of the programme of measures that we could feasibly complete by 2015 to improve the physical condition of water bodies. Consequently, we were unable to address the same number of water bodies as originally planned.	During the period 2009 to 2015: Scottish Ministers increased the level of funding available to support action; SEPA created a dedicated unit to promote and support action; where action was unavoidably delayed , where possible effort was switched to other water bodies, to ensure as much progress as possible by 2015	5

Table A2.8: Reasons why improvement targets for the condition of water bodies were not achieved continued

Reason improvement targets were not achieved	Overview	Interim action taken	Number of water bodies
It proved infeasible to complete the necessary actions and achieve the improvement target by 2015 for 11 water bodies.	We underestimated the extent to which land management practices in the catchments of four water bodies needed to be improved and the time it would take to identify where improvements were required and to then implement changes. Public bodies and land managers worked together as part of our diffuse pollution priority catchment approach. Changes in land management practices began to be made late in the period 2009 to 2015 and we expect this will result in improvements in water quality in the early part of the period 2015 to 2021.	During the period 2009 to 2015, we developed and refined the diffuse pollution priority catchment approach for tackling rural diffuse pollution.	4
	In 2009, we found evidence that bottom-living invertebrate animals were not in a good condition in one water body. The method we use to assess the condition of these animals is usually indicative of the impact of pollution. During the period 2009 to 2015, we were unable to pin point the cause of the impact and hence it was not feasible to make the improvements in the condition of the invertebrates that we had planned.	We introduced general binding rules on how agricultural land management practices must be carried out to reduce diffuse source pollution	1
	In 2009, we found evidence that dissolved oxygen concentrations were at levels we normally expect will lead to the condition of water animals being poor. However, our assessments indicated that the condition of the latter was already moderate: Restoring oxygen concentrations to moderate levels would not improve ecological quality and was not necessary to achieve our 2015 objective with respect to the ecological condition of the water body. Because of the scale of the programme of work needed across Scotland to reduce diffuse source pollution, we had phased the work needed to restore good dissolved oxygen levels over a longer period up to 2021.	We introduced general binding rules on how agricultural land management practices must be carried out to reduce diffuse source pollution	1

Progress in improving the condition of bodies of groundwater

In 2009, we set an objective of improving the chemical status of one body of groundwater. During the period 2009 to 2015, we revised the delineation of bodies of groundwater. In 2014, the chemical status of the groundwater body that most closely corresponds to the original body was good.

Progress in preventing deterioration in the condition of water bodies

One of the primary objectives of the programme of measures we established in the first river basin management plan in 2009 was to protect water bodies from deterioration.

To help inform and target action to achieve this objective, we used monitoring results to identify trends in the concentration of pollutants that could, if unchecked, lead to deterioration in the condition of water bodies[12]. We also identified water bodies at risk from the spread of invasive non-native species and those that had little capacity to accommodate any increase in pressure and were potentially at risk of deterioration.

All developments that would pose a risk to the water environment were made subject to a requirement for prior-authorisation before they could proceed. Where a development proposal would entail significant new modifications to, and resulting deterioration of, the water environment, authorisation was only granted where:

- the development's benefits to sustainable development, human health or the maintenance of human safety outweighed the benefits of preventing deterioration and achieving a good condition;
- for reasons of technical feasibility or disproportionate cost, the development's benefits could not be achieved by other means, which would represent a significantly better environmental option;
- all practicable steps would be taken to mitigate the adverse impact on the condition of the water bodies concerned.

Table A2.9: Progress in preventing deterioration in the condition of water bodies

	Number of water bodies where their condition was maintained
Target set for the period 2009 to 2015	481 (100%)
Target achieved	480

Table A2.10: Reasons where deterioration occurred

Reason target not achieved	**Number of water bodies where deterioration in their condition was permitted during the period 2009 to 2015**
New modifications permitted to secure public drinking water supplies	1

Note to table A2.10: Further explanation of the reasons deterioration was permitted is available in the information provided for each water body in the **Water environment hub**.

[12] See http://www.sepa.org.uk/media/37232/current-condition_challenges-for-future_solway-tweed_public-consultation.pdf

Progress in achieving our objectives for protected areas

In 2009, we set improvement objectives for the period 2009 to 2015 for a number of protected areas for wildlife conservation and bathing. During the period, we introduced new, stricter standards and hence more challenging targets for protected areas for bathing.

We also set the objective of preventing deterioration in the quality of drinking water protected areas over the period 2009 to 2015. One drinking water protected area was identified as at particular risk and targeted action was taken to protect it, including action to address rural diffuse pollution.

Table A2.11: Progress towards achieving our targets for protected areas

	No. of drinking water protected areas where water quality was safeguarded and maintained	**No. of bathing waters in a sufficient, good or excellent condition**	**No. of protected areas for wildlife where the water bodies on which the areas' objectives depend are in the required target condition[1]**
Target set for 2015	106 (100%)	7 (100%)	1
Target achieved	106	3	1

Note to table A2.11: For protected areas for wildlife, our target was to improve those characteristics of the water bodies on which the conservation of the protected wildlife depends, to a good condition.

We also set a target for improving water quality in one shellfish water protected area, Loch Ryan. During the period 2009 to 2015, the major point source discharges to the loch have ceased and the level of treatment of a number of smaller discharges has been significantly increased.

Summary of changes since the publication of the first river basin management plan in 2009

The following section summarises how this plan changes the first plan we published in 2009. We have made the changes in response to:

- improvements in our understanding of pressures and impacts on the water environment and hence where action is needed and the scale of that action;
- the significant management challenges that we identified during the course of implementing the first plan between 2009 and 2015;
- improvements in our understanding of where we can prioritise action to deliver the greatest benefits.

Feedback and advice from businesses, voluntary organisations, scientists and the wider public has informed each of the above and our response to them.

The first plan included improvement targets for 2021 and 2027. It also identified a number of water bodies for which the achievement of a good condition was not considered possible. In preparing this plan, we considered afresh each water body that was not in a good condition in 2015. Wherever feasible and proportionate, we have set an objective of achieving a good condition in these water bodies by 2021, natural rates of recovery permitting.

Table A2.12: Summary of changes to measures and objectives for rural diffuse pollution

	Plan	Number of water bodies		
		Good by 2021	Good by 2027	Good after 2027
• During 2009-2015 we improved our understanding of water quality impacts and concluded that water quality in fewer water bodies are impacted by diffuse pollution than we thought in 2009. • For those affected by rural diffuse pollution, public bodies and land managers will work together using our revised and strengthened diffuse pollution priority catchment approach. • We have also factored our latest understanding of the time likely to be needed for pollutants to flush out of the system and healthy water plants and animal communities to re-establish following the completion of measures to address the sources of pollution into the dates we expect our objectives to be reached.	1st	38	42	5
	2nd	31	12	3

To maximise the benefits delivered by the programme of measures over the period 2015 to 2021, we have re-prioritised effort between action to improve physical condition and action to remove barriers to fish migration. This has involved significantly increasing our targets for removing barriers to fish migration and focusing effort on fewer but more demanding improvements to the physical condition of water bodies.

Table A2.13: Summary of changes to measures and objectives for the physical condition of water bodies

	Plan	Number of water bodies	
		Good by 2021	Good by 2027
• We will focus our effort on fewer but more demanding improvements to the physical condition of water bodies (in terms of the complexity and costs of the works required) where we expect to deliver particularly significant social and economic benefits. • A step change in approach will be taken to securing action with a strengthened delivery framework and increased funding to support action. • Studies to scope all improvements planned for the period 2021 to 2027 to be completed in the period 2015 to 2021 to help streamline action in the period 2021 to 2027.	1st	36	64
	2nd	11	44

Table A2.14: Summary of changes to measures and objectives in relation to barriers to fish migration

	Plan	Number of water bodies	
		Good by 2021	Good by 2027
• We have significantly increased our targets for removing barriers to fish migration because of the potential to restore access for fish migration to a very large area of river habitat. • A step change in approach with a strengthened delivery framework; increased funding to support action; and a substantially increased number of water bodies targeted for improvement by 2021. • Studies to scope all improvements planned for the period 2021 to 2027 to be completed in the period 2015 to 2021 to help ensure action can be completed by 2027. • Action prioritised for the period 2015 to 2021 based on a much improved understanding of the benefit to fish stocks as well as the number of barriers in the district.	1st	7	27
	2nd	39	37

Table A2.15: Summary of changes to measures and objectives on water flows and levels

	Plan	Number of water bodies	
		Good by 2021	Good by 2027
• During 2009-2015 we improved our understanding of flows and levels impacts and as a result our latest assessment is that fewer water bodies are impacted than we thought in 2009. • Re-phased objectives, setting a target of good by 2021 except where (a) we are not certain that pressures on flows and levels are resulting in impacts on water plants and animals; or (b) the scale of the programme of works required would be infeasible to complete by 2021. • Action prioritised for the period 2015 to 2021 based on improved understanding of impacts of pressures on flows and levels.	1st	23	33
	2nd	13	13

Appendix 3: Water Framework Directive requirements

Table A3.1: Water Framework Directive 2000/60/EC

Reference	Description of Requirement	Location in RBMP
Annex VII, A 1	A general description of the characteristics of the river basin district required under Article 5 and Annex II	Scotland: Appendix 8.3 England: EA Part 2
Annex VII, A 1.1	Mapping of the location and boundaries of surface water bodies	**Water environment hub** EA GeoPDF on share file. EA Part 2 section 4.3
Annex VII, A 1.1	Mapping of the ecoregions and surface water body types within the river basin	**Water environment hub** EA GeoPDF on sharefile. EA Part 2 section 4.3
Annex VII, A 1.1	Identification of reference conditions for the surface water body types Background to classification scheme Biological reference conditions Chemical, physiochemical and hydromorphological reference conditions	Scotland: Appendix 8.3 England: EA Part 2 section 4.1.1 and linked documents UKTAG reference conditions Ministerial directions on standards
Annex II, 1.3 (vi)	Reasons for exclusion of quality element(s) from the assessment of ecological status for a surface water body type (due to lack of reliable type-specific reference conditions)	Scotland: Appendix 8.3 England: EA Part 2 UKTAG reference conditions Ministerial directions on standards
Annex VII, A 1.2	Mapping of the location and boundaries of groundwater bodies	**Water environment hub** England: EA GeoPDF on sharefile. EA Part 2 section 4.3
Annex VII, A 6	Summary of economic analysis	Scotland: Appendix 8.3 England: EA Part 2 section 5.3 and linked document

Table A3.1: Water Framework Directive 2000/60/EC continued

Reference	Description of Requirement	Location in RBMP
Annex VII, A 2	A summary of significant pressures and impact of human activity on the status of surface water and groundwater, including: estimation of point source pollution, estimation of diffuse source pollution, including a summary of land use, estimation of pressures on the quantitative status of water including abstractions, analysis of other impacts of human activity on the status of water	Overall summary: Solway Tweed RBMP main plan document Water body-specific information: **Water environment hub** England: EA Part 2section 4.4
Annex VII, A 3	Identification and mapping of protected areas	Appendix 1 **Water environment hub** England: EA Part 2 section 3.1.2 and linked documents.
Annex V, 1.3 Annex V, 2.2.1 And Annex VII, A 4	A map of the monitoring networks established for the purposes of Article 8 and Annex V	**Water environment hub** England: EA GeoPDF on sharefile
Annex VII, A 4.1	A presentation in map form of the results of the monitoring programmes for the status of surface water (ecological and chemical)	**Water environment hub** England: EA GeoPDF on sharefile
Annex V, 1.3	Estimates of the level of confidence and precision of the results provided by the monitoring programmes for surface water	**Water environment hub** England: EA GeoPDF on sharefile
Annex V, 1.4.2	Indication, by a black dot on the map, of failure to achieve good status or potential in the water body due to non-compliance with standard(s) for specific pollutant(s) in surface water	**Water environment hub** England: EA GeoPDF on sharefile

Table A3.1: Water Framework Directive 2000/60/EC continued

Reference	Description of Requirement	Location in RBMP
Annex VII, A 4.2	A presentation in map form of the results of the monitoring programmes for the status of groundwater (chemical and quantitative)	**Water environment hub** England: EA GeoPDF on sharefile
Annex V, 2.4.1	Estimates of the level of confidence and precision of the results provided by monitoring programmes for groundwater	**Water environment hub** England: EA GeoPDF on sharefile
Annex V, 2.4.5	Indication, by a black dot on the map, of groundwater bodies subject to a of significant and sustained upward trend in pollutant concentrations due to human activity	England: EA GeoPDF on sharefile
Annex V, 2.4.5	Indication, by a blue dot on the map, of groundwater bodies subject to a significant and sustained reversal in pollutant concentration due to human activity	**Water environment hub** England: EA GeoPDF on sharefile
Annex VII, A 4.3	A presentation in map form of the results of the monitoring programmes for the status of protected areas	**Water environment hub** England: EA GeoPDF on sharefile
Annex VII, A 5	A list of the environmental objectives established under Article 4 for surface waters, groundwaters and protected areas	Objectives for each water body: **Water environment hub** Summary information on objectives for all surface waters and groundwater: Solway Tweed RBMP main plan document Further information on objectives for artificial and heavily modified water bodies Scotland: Appendix 8.1 England: EA Part 2 section 5 and linked data set from section 1

Table A3.1: Water Framework Directive 2000/60/EC continued

Reference	Description of Requirement	Location in RBMP
Article 4(4) and Annex VII, A 5	Identification of instances where use has been made of Article 4(4) (extension of deadline for achievement of objectives beyond 2015), and the associated information required under that Article	**Water environment hub** England: EA Part 2 Section 5 and linked data set from section 1
Article 4(5) and Annex VII, A 5	Identification of instances where use has been made of Article 4(5) (less stringent environmental objectives), and the associated information required under that Article	**Water environment hub** England: EA Part 2 Section 5 and linked data set from section 1
Article 4(6) and Annex VII, A 5	Identification of instances where use has been made of Article 4(6) (temporary deterioration in status), and the associated information required under that Article	**Water environment hub** England: EA Part 2 Section 5 and linked data set from section 1
Article 4(7) and Annex VII, A 5	Identification of instances where use has been made of Article 4(7) (deterioration in status for new modifications), and the associated information required under that Article	**Water environment hub** England: EA Part 2 Section 5 and linked data set from section 1
Annex VII, A 7	A summary of the programme of measures adopted under Article 11, including how Article 4 objectives are thereby to be achieved.	Solway Tweed RBMP main plan document Scotland: Appendix 8.4 England: EA Measures and Mechanisms document
Annex VII, A 7.1	A summary of the measures required to implement Community legislation for protection of water	Solway Tweed RBMP main plan document Scotland: Appendix 8.4, which includes legislative instruments. England: EA Measures and Mechanisms document

Table A3.1: Water Framework Directive 2000/60/EC continued

Reference	Description of Requirement	Location in RBMP
Article 9 and Annex VII, A 7.2	A report on the practical steps and measures taken to apply the principle of recovery of costs of water use and to incentivise efficient water use in accordance with Article 9	Scotland: Appendix 8.5 England: EA Part 2 section 3.6
Annex VII, A 7.3	A summary of the measures taken to meet the requirements of Article 7 (protection of waters used for the abstraction of drinking water)	Appendix 1 England: EA Measures and Mechanisms document
Annex VII, A 7.4	A summary of the controls on abstraction and impoundment of water including reference to the registers and identifications of the cases where exemptions have been made under Article 11(3)(e)	Scotland: Appendix 8.4 England: EA Measures and Mechanism document
Annex VII, A 7.5	A summary of the controls adopted for point source discharges and other activities with an impact on the status of water in accordance with Article 11(3)(g) and 11(3)(i)	Scotland: Appendix 8.4 England: EA Measures and Mechanism document
Annex VII, A 7.6	Identification of the cases where direct discharges to groundwater have been authorised in accordance with Article 11(3)(j)	Scotland: None authorised England: EA Measures and Mechanism document
Annex VII, A 7.7	A summary of the measures taken in accordance with Article 16 on priority substances	Scotland: Appendix 8.4 England: EA Measures and Mechanism document
Annex VII, A 7.8	A summary of the measures taken to prevent or reduce the impact of accidental pollution incidents	Scotland: Appendix 8.4 England: EA Measures and Mechanism document

Table A3.1: Water Framework Directive 2000/60/EC continued

Reference	Description of Requirement	Location in RBMP
Annex VII, A 7.9	A summary of the measures taken under Article 11(5) for bodies of water unlikely to achieve objectives	Scotland: Appendix 8.4 England: EA Measures and Mechanism document
Annex VII, A 7.10	Details of the supplementary measures identified as necessary to meet objectives	Scotland: Appendix 8.4 England: EA Measures and Mechanism document
Annex VII, A 7.11	Details of the measures taken to avoid increase in pollution of marine waters in accordance with Article 11(6)	Scotland: Appendix 8.4 England: EA Measures and Mechanism document
Annex VII, A 8	A register of any more detailed programmes and management plans for the river basin district dealing with particular sub-basins, sectors, issues or water types, together with a summary of their contents	Appendix 4
Annex VII, A 9	A summary of the public information and consultation measures taken, their results, and the changes to the plan made as a consequence	Appendix 8.4 Appendix 4
Annex VII, A 10	A list of competent authorities in accordance with Annex I	Appendix 5
Annex VII, A 11	The contact points and procedures for obtaining details of the control measures adopted in accordance with Article 11(3)(g) (for point source discharges liable to cause pollution) and 11(3)(i) (for any other significant adverse impacts on the status of water, in particular morphological alterations)	Appendix 5

Table A3.1: Water Framework Directive 2000/60/EC continued

Reference	Description of Requirement	Location in RBMP
Annex V11 A 11	The contact points and procedures for obtaining details of the actual monitoring data gathered in accordance with Article 8 and Annex V	Appendix 5
Annex VII B 1	A summary of any changes or updates since the publication of the previous version of the river basin management plan, including a summary of the reviews to be carried out under Article 4(4), (5), (6) and (7)	Appendix 2
Annex VII B 2	An assessment of the progress made towards the achievement of the environmental objectives, including presentation of the monitoring results for the period of the previous plan in map form and an explanation for any environmental objectives which have not been reached	**Water environment hub** Appendix 2
Annex VII B 3	A summary of, and an explanation for, any measures foreseen in the earlier version of the river basin management plan which have not been undertaken	Appendix 2
Annex VII B 4	A summary of any additional interim measures adopted under Article 11(5) since the publication of the previous version of the river basin management plan. "Where monitoring or other data indicate that the objectives set under Article 4 for the body of water are unlikely to be achieved"	Appendix 2

Table A3.2: Groundwater Daughter Directive 2006/11/EC

Reference	Description of Requirement	Location in RBMP
Article 3(5) Annex II Part A	Publication of threshold values for assessing groundwater chemical status.	Scotland: Appendix 8.3 England: EA Part 2
Annex II Part C	A summary of the way in which guidelines set out in Annex II Part A were followed	Scotland: Appendix 8.3 England: EA Part 2
Annex II Part C	Information on number of bodies/groups of bodies of groundwater characterised as at risk and on the pollutants/indicators of pollution which contribute to this classification, including observed concentrations/values	**Water environment hub**
Annex II Part C	Information on each body characterised as at risk	**Water environment hub**
Annex II Part C	Whether threshold values apply at national, river basin district, or body level	**Water environment hub**
Annex II Part C	Relationship between threshold values and (i) for naturally-occurring substances, observed background levels; (ii)environmental quality objectives and other standards for water protection at nation/community/international level; (iii) any relevant info re toxicology, eco-tox, persistence, bioaccumulation, and dispersion tendency of pollutants	Scotland: Appendix 8.3 England: EA Part 2
Article 3 (6)	Changes to list of threshold values	Scotland: Appendix 8.3 England: EA Part 2

Table A3.2: Groundwater Daughter Directive 2006/11/EC continued

Reference	Description of Requirement	Location in RBMP
Article 4 (4)	A summary of the assessment of groundwater chemical status, including an explanation as to the manner in which exceedances of quality standards or threshold values at individual monitoring points have been taken into account in the final assessment	**Water environment hub** Scotland: Appendix 8.3 England: EA Part 2
Article 5 (4)	A summary of: (1) the way in which trend assessment from individual monitoring points within a body/group of bodies of GW has contributed to identifying that those bodies are subject to a significant and sustained upward trend in concentration of any pollutant, or a reversal of that trend; (2) the reasons for the starting points defined for trend reversal under Article 5(3)	Scotland: Appendix 8.3 England: EA Part 2
Article 5 (5)	Summary of the results of trend assessments carried out for identified pollutants to assess impact of existing plumes that may threaten achievement of WFD objectives, in particular plumes from point sources and contaminated land	**Water environment hub**

Table 3: Environmental Quality Standards (EQS) Directive 2008/105/EC

Location in Directive	Description of Requirement	Location in RBMP
Recital 17	Exemptions to application of the EQS for priority substances applied in accordance with Art 4(4), (5) and (6) of WFD should be reported.	None
Article 4 (2)	If mixing zones are designated, a description of(a) approaches and methodologies applied in order to define zones; and (b) measures taken to reduce extent of mixing zone in future, such as those under 11(3)(k) WFD or by reviewing permits (Directive 2008/1/EC) or prior regulations referred to in Art 11(3)(g) WFD must be reported.	None designated
Article 5 (4)	An updated inventory of emissions/discharges and losses must be reported.	Appendix 6
Article 6 (2)	A summary of the measures taken in instances of transboundary pollution	No instances identified

Appendix 4: Consultation and engagement

This appendix provides a summary of the consultation undertaken and engagement opportunities provided through the river basin planning process. It explains how stakeholders have contributed to the development of Solway Tweed river basin management plan including:

- consultation opportunities;
- active involvement in the river basin planning process;
- public access to information.

Consultation opportunities

Consultations undertaken in the Solway Tweed river basin district across the first cycle 2009-2015 and the key outputs are presented in Table A4.1.

Table A4.1: Consultations for the Solway Tweed river basin district

Title	Brief description of document	Key outputs of consultation and how it informed the planning process and/or draft RBMP	Period of consultation	Lead Organisation
Working together to protect and improve Solway Tweed water environment: Getting involved in developing the second river basin plan	Sets out proposals on the timetable and work programme to produce the second RBMP and explained how people can get involved in river basin planning.	The consultation and associated digest of responses can be found at: http://www.sepa.org.uk/environment/water/river-basin-management-planning/publications/	31 August 2012 – 28 February 2013	SEPA Environment Agency
Improving the physical condition of Scotland's water environment	A supplementary plan was produced to identify the work and propose approaches needed to deliver river basin management planning objectives for the physical condition of the water in the Scottish part of the Solway Tweed river basin district environment, as well as a wide range of environmental, social and economic benefits.	The consultation and associated digest of responses can be found at: http://www.sepa.org.uk/environment/water/river-basin-management-planning/publications/	27 November 2012 – 14 March 2013	SEPA

Title	Brief description of document	Key outputs of consultation and how it informed the planning process and/or draft RBMP	Period of consultation	Lead Organisation
Current Condition and Challenges for the Future: Solway Tweed basin district	An update on the risk assessment on the attainment of objectives set out in the first river basin plan and provides evidence base for updating and reviewing objectives and the programme of measures in the second plans.	The consultation and associated digest of responses can be found at: http://www.sepa.org.uk/environment/water/river-basin-management-planning/publications/	22 December 2013 – 22 June 2014	SEPA Environment Agency
A public consultation on the development of the second river basin management plan for the Solway Tweed river basin district	The consultation set out the proposed environmental objectives for the next two cycles and sets out the strategies to achieve them.	The consultation and associated digest of responses can be found at: http://www.sepa.org.uk/environment/water/river-basin-management-planning/publications/	9 December 2014 – 9 June 2015	SEPA Environment Agency
Delivering Scotland's River Basin Management Plans: Improving the Physical Condition of Scotland's Water Environment	This consultation proposed several key steps to strengthen the delivery framework for improving the physical condition of Scotland's water environment.	The consultation and associated digest of responses can be found at: http://www.gov.scot/Publications/2015/08/2127/1	27 February 2015 – 22 May 2015	Scottish Government

Active involvement in the planning process

To be successful river basin management planning requires co-ordination and integration; which is only achievable through partnership working. The challenge of meeting the targets set in the river basin plans is a shared goal for Governments, SEPA and Environment Agency, responsible authorities, voluntary groups and sector representatives. Opportunities for active involvement in the river basin planning process throughout the first cycle 2009 to 2015 are presented in Table A4.2.

Table A4.2: Opportunities for active Involvement in the planning process in the Solway Tweed RBD

Sectors, groups and networks	Activity
River basin management planning advisory group network	The advisory group network, established several years before publication of the first RBMP, has continued to play an important role in the delivery of river basin planning across the river basin during the first cycle and development of the second river basin plan. During implementation they has evolved and adapted the way they work to best suit the needs and demands of the planning process at that time and will continue to play a key role during the second and third cycles. The Tweed Forum continues to act as the support and implementation lead for river basin planning in the Tweed. In the Solway the advisory group functions have been taken up by the North Solway Group and catchment groups in England. Partnership working at a catchment level is vital to the delivery of the plan's objectives, whether in England or Scotland. For more information on the catchment approach see the Working Together section in the basin plan. In Scotland a number of topic specific groups have been established to help manage delivery of key pressures. This includes: **Diffuse Pollution Management Advisory Group** The Diffuse Pollution Management Advisory Group (DPMAG) consists of stakeholders with rural diffuse pollution interests. Further information can be found at: http://www.sepa.org.uk/environment/water/river-basin-management-planning/who-is-involved-with-rbmp/dpmag/ **Fish and Fisheries Advisory Group** The Fish and Fisheries Advisory Group (FFAG) consists of responsible authorities, national stakeholders and organisations working on fisheries at a strategic level. Further information can be found at: http://www.sepa.org.uk/environment/water/river-basin-management-planning/who-is-involved-with-rbmp/ffag/
Sector specific activities	In addition to these networks specific active involvement has been encouraged in a wide variety of important different sectors: workshops for forestry and wastewater sectors, individual site discussions for regulated industry and integration with flooding, strategic and local developments plans through consultation responses and dialogue. An invasive non-native species (INNS) supplementary plan was developed for the Scottish part of the Solway Tweed. It was aimed at organisations with a strategic role in the management of INNS. The main purpose of the plan was to identify any gaps in delivery, resources and co-ordination that increase the risk of failing to achieve Water Framework Directive (WFD) objectives and identify a plan of action to address those gaps. It can be accessed here: http://www.sepa.org.uk/environment/water/river-basin-management-planning/publications/ In addition a number of biosecurity plans were developed by Fishery Trust in the Scottish part of the Solway Tweed that contribute to the implementation of the river basin management plan.

Public access to information

The Scottish Government website provides the policy and regulatory framework to ensure WFD principles are embedded in all relevant work.
http://www.gov.scot/Topics/Environment/Water/15561

Access to more information and contact details has been provided on SEPA's river basin planning web page. http://www.sepa.org.uk/. The Environment Agency river basin planning page is: https://www.gov.uk/government/collections/river-basin-management-plans

Information on the websites include:

- description of the river basin planning process;
- information on the advisory groups with background documentation such as details of meetings;
- all consultation documents and supplementary plans or links provided;
- online consultation tool that has been used to facilitate responses;
- publication of all consultation digests or links provided.

Scotland's Environment Web http://www.environment.scotland.gov.uk/ provides a centralised point of access to data from multiple sources, and transforms that data into format that is accessible and useable to a wider audience. Classification results down to parameters level are provided online in spreadsheet form and an interactive map displays overall classification.

In addition, Farming and Water Scotland web resource http://www.farmingandwaterscotland.org/ was established by DPMAG, the Scottish Government, Scotland's Rural College (SRUC), NFUS and SEPA and launched in 2014. This website is the guide to reducing pollution risks from the farm and can help farmers identify and reduce diffuse pollution risks and keep on the right side of the regulations.

Although advertisements of public consultations were promoted using the advisory group network, we have also posted several public notices:

- *Working together to protect and improve Solway Tweed water environment: Getting involved in developing the second river basin plan* - Edinburgh Gazette, London Gazette, Cumberland News and Berwick Advertiser.
- *Current condition and challenges for the future: Solway Tweed river basin district* - Edinburgh Gazette, London Gazette, Cumberland News and Berwick Advertiser.
- *A public consultation on the development of the second river basin management plan for the Solway Tweed river basin district* -Edinburgh Gazette, London Gazette, The Herald for Scotland, Cumberland News and Berwick Advertiser.

Appendix 5: Competent authorities

This appendix sets out the names and addresses of competent authorities for the implementation of the Water Framework Directive within the Solway Tweed river basin district and a note of their legal status and responsibilities.

Competent authorities

The competent authorities for the Solway Tweed river basin district (Solway Tweed RBD) are:

- Scottish Ministers;
- Secretary of State;
- Scottish Environment Protection Agency (SEPA);
- Environment Agency.

Legal status

Scottish Ministers
Under Section 44 of the Scotland Act 1998, the Scottish Ministers comprise the First Minister, other Scottish Ministers appointed by the First Minister, the Lord Advocate and the Solicitor-General for Scotland. www.opsi.gov.uk/acts/acts1998/ukpga_19980046_en_1.htm

The Secretary of State is legally part of the Crown and is not established in legislation.

SEPA and Environment Agency
SEPA and the Environment Agency are non-departmental public bodies established by the Environment Act 1995. www.opsi.gov.uk/acts/acts1995/Ukpga_19950025_en_1.htm

Responsibilities of competent authorities

Article 3(2) of the Water Framework Directive requires Member States to identify the appropriate competent authority for the application of the rules of the directive within each river basin district. For the Solway Tweed river basin district responsibilities are set out in The Water Environment (Water Framework Directive) (Solway Tweed River Basin District) Regulations 2004 and the subsequent Directions.

In Scotland the competent authority role is undertaken by Scottish Ministers and SEPA. The legislation transposing the Water Framework Directive in Scotland, namely Part 1 of the Water Environment and Water Services (Scotland) Act 2003, requires Scottish Ministers and SEPA to exercise their functions under the Act and a range of other designated legislation so as to secure compliance with the requirements of the Directive.

In addition, Scottish Ministers and SEPA must:

- have regard to the social and economic impact of exercising their functions;
- where relevant, promote sustainable flood management;
- act in the way best calculated to contribute to the achievement of sustainable development;
- so far as practicable, adopt an integrated approach by cooperating with each other and designated responsible authorities[13] with a view to coordinating the exercise of their respective functions.

[13] SEPA and Scottish Ministers are assisted in delivering river basin management planning by a number of designated responsible authorities: http://www.opsi.gov.uk/legislation/scotland/ssi2008/ssi_20080263_en_1

The Scottish Ministers may give directions and guidance to SEPA in relation to the exercise of SEPA's functions as a competent authority. SEPA must comply with any such directions and have regard to any such guidance.

The Scottish Ministers have additional specific responsibilities for:

- designating river basin districts;
- identifying bodies of water for abstraction for drinking water;
- approving (or seeking modifications of) river basin management plans.

SEPA is also the authority responsible for enforcing regulatory controls on a wide range of activities that impact on the water environment in Scotland under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 and other secondary legislation.

The Scottish Ministers are the appellate authority under the 2011 Regulations.

For more details on the responsibilities of competent authorities please see the Water Environment and Water Services (Scotland) Act 2003 and the Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulation 2013 at: www.sepa.org.uk/regulations/water.

In England there are two competent authority roles – the appropriate authority role undertaken by the Secretary of State and the 'Agency' role undertaken by the Environment Agency.

The 'appropriate authority' has general responsibility for ensuring the directive is given effect. That appropriate authority also has specific responsibility for ensuring that appropriate economic analysis is carried out, approving proposals for environmental objectives and programme of measures and approving the draft river basin management plans. The appropriate authority may also give guidance or directions to the 'Agency' and any other public body, on the practical implementation of the directive. The appropriate authority for a river basin district also has the duty to ensure that the requirements of the directive are given effect in relation to the district as a whole.

SEPA and the Environment Agency (the 'Agencies') are responsible for carrying out the analysis required for characterisation and monitoring, prepare proposals for environmental objectives and programme of measures for each river basin district and prepare draft river basin management plans. The Agencies must also ensure public participation in preparation of the river basin management plan and make certain information required under the directive accessible to the public.

Membership

Not applicable. (The Water Framework Directive requires us to record if a competent authority acts as a co-ordinating body for other competent authorities and, if so, what the membership of that group is).

Contact points and further information

Further information regarding the responsibilities described in section 1 above, advice on the information the agencies can provide and how to obtain it and information regarding protecting the Solway Tweed water environment can be accessed by going to the following websites:

- www.sepa.org.uk/water/river_basin_planning.aspx
- https://www.gov.uk/government/organisations/environment-agency
- www.gov.scot/Topics/Environment/Water/15561
- https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs

If you would like to write to the competent authorities you can find contact details at:

Scottish Ministers
Water Environment Team
Environmental Quality Division
Scottish Government
Area 1-D North
Victoria Quay
Edinburgh EH6 6QQ

Secretary of State for Environment, Food and Rural Affairs
Nobel House
17 Smith Square
London
SW1P 3JR

Scottish Environment Protection Agency (SEPA)
Strathallan House
Castle Business Park
Stirling
FK9 4TZ

Environment Agency
National Customer Contact Centre
PO Box 544
Rotherham
S60 1BY

If the required information is not published on the websites, it can be requested by writing to the above addresses or emailing:

- rbmp@sepa.org.uk;
- SolwaytweedRBD@environment-agency.gov.uk;
- writing to, telephoning or visiting any SEPA office;
- telephoning the Environment Agency: 03708 506506

SEPA office opening hours are 9.00 – 5.00pm Monday to Friday, except for Christmas, New Year, Easter and St Andrew's Day public holidays.

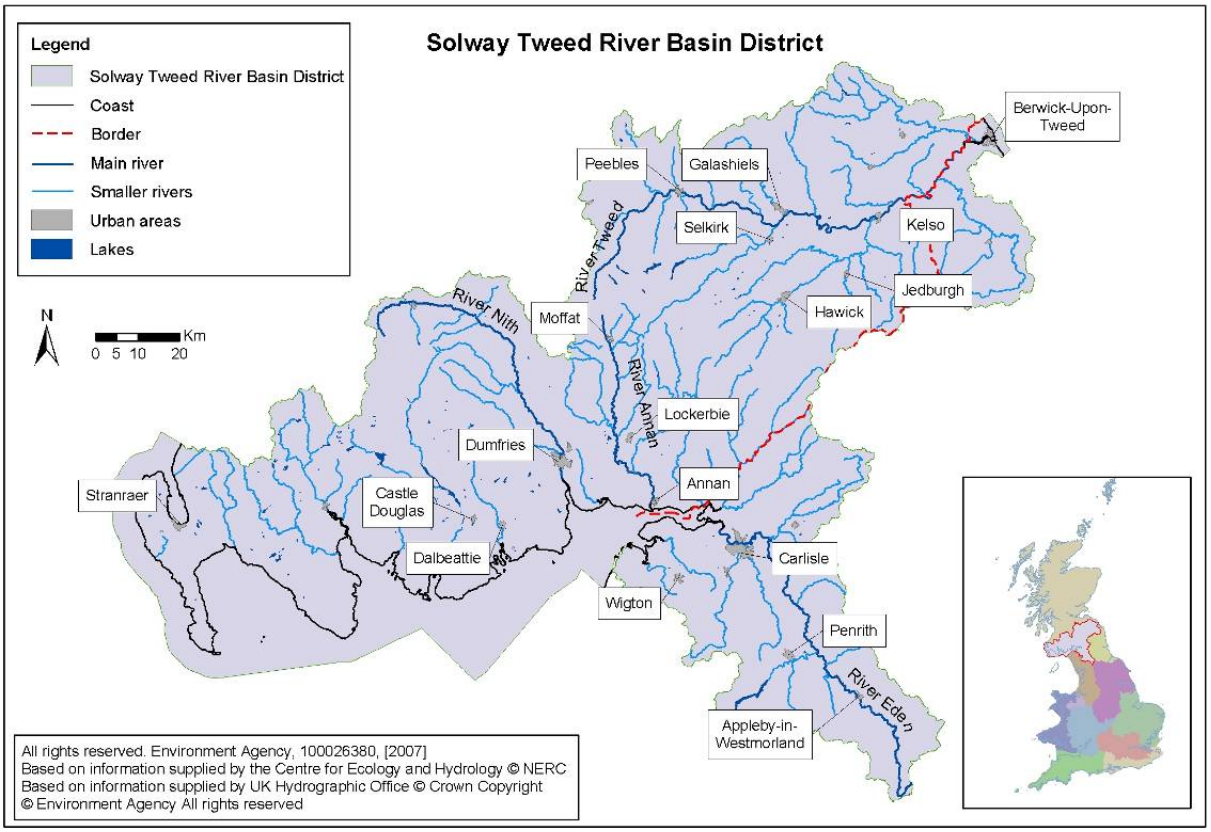
For specific queries on river basin management planning for the Solway Tweed RBD please contact the River Basin Planning unit manager who will co-ordinate a response:

River Basin Planning Unit Manager
SEPA, Strathallan House, Castle Business Park, Stirling FK9 4TZ
Tel: 01786 457700
Email: rbmp@sepa.org.uk

Geographical coverage of Solway Tweed river basin district

The geographical coverage of the Solway Tweed river basin district (the Solway Tweed RBD) is shown in the map below.

Figure A5.1: Solway Tweed river basin district



Appendix 6: An Inventory of Emissions for priority substances for the Solway Tweed river basin district

Why we compiled the inventory

Under the environmental quality standards (EQS) Directive[14] that supplements the Water Framework Directive (WFD), we are required to report an inventory of emissions, discharges and losses of all priority substances and pollutants for both the Scotland and Solway Tweed river basin districts. For this river basin planning cycle we are reporting a baseline inventory in accordance with this requirement. This baseline will be the subject of future updates as required under the EQS Directive and Article 5 of the WFD.

We will use the inventory to help identify the main sources of listed substances in the environment and to target and demonstrate the effectiveness of programmes of measures aimed at reducing or phasing out inputs of priority substances to surface waters. The inventory will also be used by the European Commission for compliance checking with the objectives of Article 4 of the WFD on the reduction of emissions, discharges and losses for priority substances and cessation or phasing out of discharges, losses and emissions for priority hazardous substances.

How we compiled the Inventory

Under the WFD Common Implementation Strategy (CIS), a guidance document[15] was developed towards the preparation of the inventory. The guidance states that if a substance meets particular relevance criteria then an in-depth inventory of emissions, discharges and losses from point and diffuse sources as well as loads transported in rivers should be provided. By identifying relevant substances we can concentrate our efforts on those chemicals posing the greatest concern. We based our approach to compiling the inventory on this guidance, as explained below.

The EQS Directive states that the reference period for the inventory should be one year between 2008 and 2010, unless the substance is covered by Regulation 91/414/EEC (regarding plant protection products) where a three-year average can be used. Our inventory was compiled using 2009 – 2011 environmental monitoring data and 2010 point source effluent and Scottish Pollutant Release Inventory (SPRI) data.

Table A6.1 below, taken from the CIS guidance, provides a series of steps by which an inventory of emissions is produced.

[14] Directive 2008/105/EC, also known as the Priority Substances Directive.
[15] CIS for WFD. Draft technical guidance on the preparation of an inventory of emissions, discharges and losses of priority and priority hazardous substances.

Table A6.1: Scheme of tiered approach for establishing an inventory

Tier	Building Blocks	Expected Output	Results for the Inventory
STEP 1: ASSESSMENT OF RELEVANCE			
	Information sources identified in Art.5 of EQS directive, see section I.1	Decision of relevance	List of relevant and less relevant substances
STEP 2: APPROACHES FOR RELEVANT SUBSTANCES			
1. Point source information	• Data on point sources • Emissions factors	• Availability of data • Quality of data • Identification of gaps	• Point source emissions • Listing of identified data gaps
2. Riverine load approach	Add: • River concentration • Data on discharge • In stream processes	• Riverine load • Trend information • Proportion of diffuse and point sources • Identification of gaps	• Rough estimation of total lumped diffuse emissions • Verification data for pathway and source orientated approaches • Listing of identified data gaps
3. Pathway oriented approach	Add: • Land use data • Data on hydrology • Statistical data	• Quantification and proportion of pathways • Identification of hotspots • Information on adequacy of POM	• Pathway specific information • Additional spatial information on emissions
4. Source orientated approach	Add: • Production and use data e.g. from REACH • SFA • Substance specific emissions factors	• Quantification of primary sources • Complete overview of substance cycles • Information on adequacy of POM	• Source specific emissions • Total emissions to environment and proportion to surface waters

Selecting relevant chemicals for the inventory

Step 1: Assessment of Relevance

We used five relevance criteria as detailed in the CIS guidance to select substances requiring in-depth emission estimation. The relevance criteria are based on compliance with environmental quality standards (EQS), levels of emissions, trends, and expert knowledge, as follows:

1. The substance causes a failure of good chemical status in at least one water body;
2. The concentration of the substance is above half of the EQS in more than one water body;
3. Monitoring shows an increasing trend in concentrations that may cause problems for future RBMP cycles;

4. PRTR (pollutant release and transfer register) data show releases that might lead to concentrations matching the above criteria;
5. Known sources and activities causing inputs in the river basin district exist that might lead to concentrations matching the above criteria.

In-depth emissions were estimated for substances meeting one or more of these criteria. For completeness we also calculated a basic estimate of emissions, losses and discharges for substances that did not meet any of these criteria.

How we used measured and modelled data in the inventory

Step 2: Approaches for relevant substances

The CIS guidance states that point sources (tier 1) and an estimation of diffuse inputs (tier 2) should be provided as a minimum for substances identified as being relevant. The available data allowed us to meet this obligation as outlined below, but data/methodology were not available for the pathway (tier 3) and source-orientated (tier 4) approaches.

Tier 1 - Point source information
We estimated point sources to water by summing 2010 data returns from the Scottish Pollution Release Inventory (SPRI) discharge loads and other effluent discharge loads we monitored for national regulatory purposes for each relevant substance for both the Scotland and Solway Tweed river basin districts. As well as discharges to river, this included direct discharges to the marine environment.

Tier 2 - Riverine load approach
We used OSPAR principles, as indicated in the CIS guidance, and SPRI and other river discharge load data to calculate the diffuse riverine load of priority substances using the following formula:

Diffuse load = riverine load at mouth of river - Σ(SPRI and other river loads to the catchment)

The OSPAR load calculation methodology was expanded to include all priority substances (when monitoring data were available) to provide the riverine load. SPRI and other monitored discharges to a catchment were summed to provide an estimate of the point source load to the catchment. Subtracting this from the riverine load as described above provided an estimate of the diffuse load. There are some shortcomings with this approach: we have limited riverine monitoring data for some priority substances, and many relevant substances are lipophilic in nature (i.e. they partition out of the water column into other media e.g. biota or sediment, such that measured water column concentrations will be reduced).

Results, conclusions and future updates

Table A6.2 below shows the inventory of emissions for the Scottish part of the Solway Tweed river basin district. For clarity and completeness, we decided to include the data collated for all priority substances under the EQS Directive for which the data indicated there were emissions, whether relevance criteria had been met or not.

The following points should be noted:

- Though this inventory provides a baseline, as we collect more data the baseline is likely to change (the CIS guidance includes the provision to update the baseline).
- In some cases environmental monitoring data were limited so we were unable to estimate diffuse loads.
- River flow data used to calculate diffuse riverine loadings introduce a major source of variation with potential wide ranging differences in flow depending on the data source.
- Many substances have a tendency to partition into sediment and biota, reducing concentrations measured in the water column. We have not taken this into account in our diffuse load estimates.
- Comparison with other river basin districts within the UK and Member States may be difficult due to differences in the methodology used to develop inventories.

Table A6.2: Inventory of emissions to the Scottish part of the Solway Tweed river basin district 2010 (kg/year)*

Substance	Riverine point source load	Riverine diffuse source load	Marine direct discharge load	Total point source load	Total load	Relevance criteria met?
Cadmium	0.2	26.9	0.0	0.2	27.2	1,2
Hexachlorobenzene	0.0	1.4	0.0	0.0	1.4	n/a
Lead	21.0	575.9	0.0	21.0	596.9	n/a
Nickel	10.6	2,392.7	0.0	10.6	2,403.3	n/a
Octylphenol	0.0	7.8	0.0	0.0	7.8	n/a
Pentachlorobenzene	0.0	0.5	0.0	0.0	0.5	n/a
Trifluralin	0.0	0.1	0.0	0.0	0.1	n/a

Relevance criteria:
1. It causes a failure of good chemical status in at least one water body.
2. The concentration of the substance is above half of the EQS in more than one water body.
3. Monitoring shows an increasing trend in concentrations which may cause problems for future river basin management planning cycles.
4. SPRI data show releases which might lead to concentrations matching the above criteria (carried out for rivers only).
5. Known sources and activities causing inputs in the river basin district exist which might lead to concentrations matching the above criteria.

n/a results for priority substances with emissions, but that did not meet any relevance criteria.

* For Priority Substances not listed here, the data assessed showed no evidence of emission.

As part of an effort to increase our collaborative working and move towards a more harmonised methodological approach to compiling inventories, we are reporting the inventory of emissions for the English part of the Solway Tweed in this river basin planning cycle. Table A6.3 below shows the estimated emissions data for the English part of the Solway Tweed.

Because there are differences in the methodology[16] used and the substances assessed as relevant, we have not combined these emission estimates with those for the Scottish part of the Solway Tweed river basin

[16] A description of the Environment Agency for England's methodology can be found at [https://ea.sharefile.com/d-sab675d1e4d74e5e8]

district. Most notably, for the English part, tier 3 methods (see Table A6.1 above) have been used to estimate emissions for the most relevant substances. The tier 3 method uses modelled outputs from SAGIS (Source Apportionment Geographic Information System, v2010) a GIS-based source apportionment tool and surface water model (Comber et al., 2012)[17]. As with the emissions estimates for the Scottish part of the Solway Tweed river basin districts, there is a high degree of uncertainty associated with the outputs. This is summarised in Table A6.3.

Overall, there is significant uncertainty associated with many of the estimates. This is recognised in the CIS guidance as a consequence of methodological constraints for what are very complex real world scenarios. Preparation of the updated inventory is scheduled for 22 December 2019. We will undertake further work, collaboratively, to refine and improve our estimation methods for all chemicals, with the aim of revisiting and refining these baseline year estimates prior to the next RBMP cycle.

[17] Comber, S., Daldorph P., Gardner, M., Murrell, K., Smith R., Constantino, C., Buchanan, L., Hasthorpe, J. and Mills, D. (2012) Chemical source apportionment under the WFD. UKWIR WW02.

Table A6.3: Inventory of emissions to the English part of the Solway Tweed river basin district 2010 (kg/year)*

Substance	Total Point Source Load[A]	Total Diffuse Source Load	Total Load	Estimation Method[B]	Certainty (good, medium, uncertain, v uncertain)[C]
Anthracene	0.02	0	0.02	tier 2	uncertain
Brominateddiphenylether (BDPE)	0.05	0.02	0.07	tier 3	uncertain
Cadmium	15.3	27.99	43.29	tier 3	uncertain
Di(2-ethylhexyl)phthalate (DEHP)	27.45	18.18	45.63	tier 3	uncertain
Hexachlorobenzene (HCB)	0	no data	0	tier 1	uncertain
Hexachlorobutadiene (HCBD)	0	no data	0	tier 1	very uncertain
Hexachlorocyclohexane (HCH)	0	no data	0	tier 1	uncertain
Mercury	1.32	5.94	7.26	tier 3	uncertain
Nonylphenols	10.44	6.72	17.16	tier 3	uncertain
Pentachlorobenzene	0	no data	0	tier 1	uncertain
Benzo(a)pyrene	0.18	3.69	3.87	tier 3	uncertain
Benzo(b)fluoranthene	0.03	no data	0.03	tier 2	uncertain
Benzo(k)fluoranthene	0.03	no data	0.03	tier 2	uncertain
Benzo(g,h,i)perylene	0.15	2.95	3.1	tier 3	uncertain
Indeno(1,2,3-cd)pyrene	0.16	3.34	3.5	tier 3	uncertain
Tributyltin compounds (TBT)	0.01	0	0.01	tier 3	uncertain
Benzene	0	no data	0	tier 1	uncertain
1,2-dichloroethane	0	no data	0	tier 1	uncertain
Diuron	1.7	no data	1.7	tier 1	uncertain
Fluoranthene	0.18	no data	0.18	tier 1	uncertain
Isoproturon	no data	no data	no data	none	very uncertain
Lead	283.89	2155.78	2439.67	tier 3	uncertain
Napthalene	0.57	0	0.57	tier 2	uncertain
Nickel	111.18	1524.92	1636.1	tier 3	uncertain
Octylphenol	0	no data	0	tier 1	uncertain
Pentachlorophenol	0	no data	0	tier 1	uncertain
Trichloromethane	0	no data	0	tier 1	uncertain
Trichloroethylene	0	no data	0	tier 1	uncertain

[A] The total point source loads includes the contribution from marine discharges, where relevant

[B] Estimation method refers to tiers, as listed in Table 1

[C] Definitions of certainty: very good = substantial monitoring basis, all sources of emissions accounted for; good = good monitoring base, some estimation, may have one emission source unaccounted for; medium = combined monitoring and estimation techniques, not all emission sources accounted for; uncertain = very weak monitoring base, heavy reliance on estimation, more than one emission source unaccounted for; very uncertain = no monitoring data, reliant on estimation, more than one emission source unaccounted for.

Section B: Appendices providing national information

Appendix 7: National information – England

The national overview can be found here:

Part 2: RBMP overview (https://www.gov.uk/government/collections/river-basin-management-plan-update)

Appendix 8: National information – Scotland

Appendix 8.1: Heavily modified and artificial water bodies in Scottish part of Solway Tweed

What are heavily modified and artificial water bodies?

The physical characteristics of some of the district's surface waters have been substantially modified for purposes such as flood protection, land drainage and water storage for public supply or hydroelectricity generation.

Where restoring the water bodies to good ecological status would significantly compromise the benefits Scotland obtains from their modifications, we have designated them as heavily modified water bodies. Instead of good ecological status, our goal for these water bodies is to achieve good ecological potential. Good ecological potential is the ecological quality that can be achieved without a significant adverse impact on the benefits served by the modifications, including benefits to environmental interests, such as wildlife conservation.

What we have done for this plan

We have designated 47 (11%) of the Scotland part of the Solway Tweed river basin district's bodies of surface water as heavily modified water bodies. There are no artificial water bodies.

The designations were based on a review of:

i. the characterisation of surface water body types that we undertook for the first river basin management plan in 2009;
ii. the reasons for designation of those water bodies designated as heavily modified in that first plan.

The review considered:

(a) our latest data on pressures and impacts on bodies of surface water;
(b) changes in the uses of water bodies, including as a result of new developments that have been permitted since the first plan was published;
(c) whether any other means have become available that could provide equivalent benefits to those served by the modifications to the water bodies.

On the basis of the review, we have de-designated five of the heavily modified water bodies that we had designated in 2009 and designated an additional 14 heavily modified water bodies.

In the main summary of the plan for the district, we have not distinguished between non-heavily modified and heavily modified. When we have referred to a 'good condition' we mean good ecological status and good ecological potential. Details about heavily modified water bodies are available separately via the **Water environment hub**.

This appendix explains why we have designated water bodies as heavily modified and how we have assessed their condition – or ecological potential.

Reasons why we designated water bodies as heavily modified

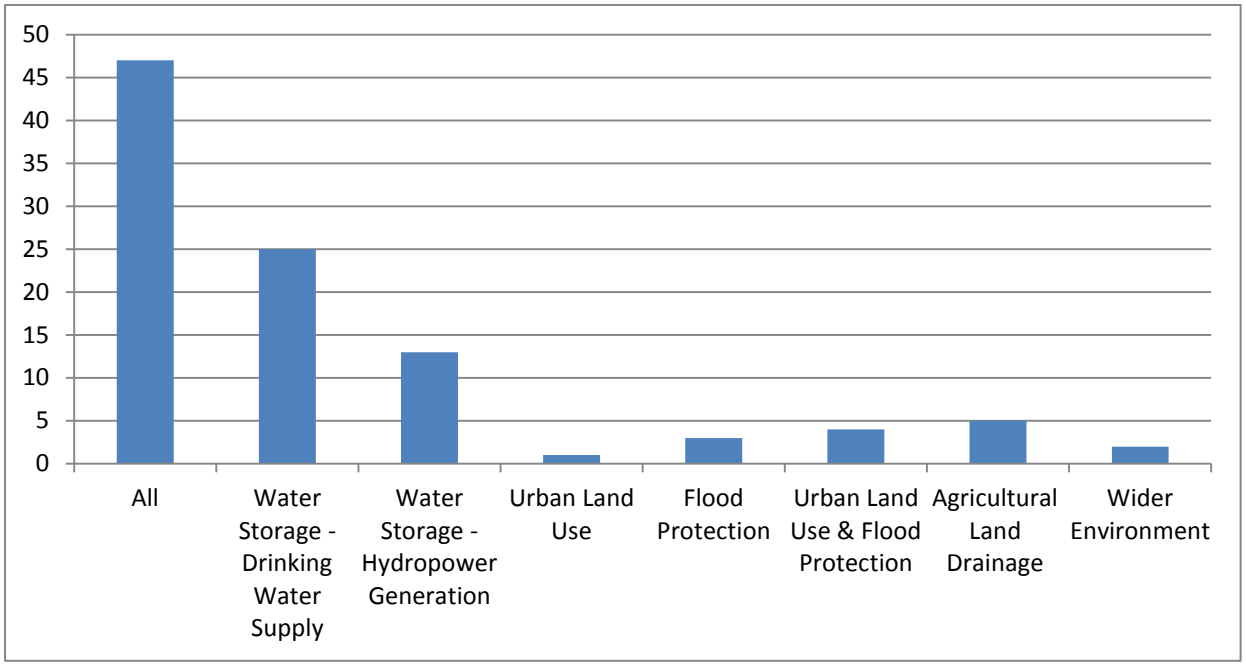
We designated the bodies of surface water as heavily modified where each of the following four criteria applied.

1. Modifications to the water body	
Criteria for designation as heavily modified	**How this was determined**
• the water body's beds, banks or shores are not in the condition needed to achieve good ecological status; or • the water body's water flows or levels are not in the condition needed for good ecological status because of storage of water in, abstraction from, or transfer to, a reservoir.	Assessment of whether or not the standards set out in the Solway Tweed River Basin District (Status) (Scotland) Directions 2014[18] for good status physical condition and good status flows and levels are met.

2. Benefits served by the modifications	
Criteria for designation as heavily modified	**How this was determined**
The modifications responsible for the impacts on the water body are necessary for: • beneficial activities, such as the provision of drinking water, flood protection, enabling and protecting urban land uses, drainage of agricultural land, hydroelectricity generation or navigation; or • wider environmental interests, such as wildlife conservation, or the protection of our built heritage	Identification of the purposes served by the modifications (Figure A8.1.1)

[18] http://www.gov.scot/Publications/2014/08/8128

Figure A8.1.1 Beneficial purposes served by the water bodies we have designated as heavily modified



Note to figure A8.1.1: Two HMWBs (4.3%) have modifications serving more than one beneficial purpose. The water bodies concerned feature in more than one of the bars in the figure.

3. Impact of restoring a good condition on the benefits served by the modifications	
Criteria for designation as heavily modified	**How this was determined**
Restoring the conditions needed to achieve good ecological status would have a significant adverse effect on the benefits served by the modifications	**For:** • **Water storage for hydroelectricity or drinking water supply** • **Urban land uses** • **Flood protection** • **Navigation – ports and harbours** • **Wildlife conservation**
	• identification of the improvements required to achieve the standards set out in The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014[19] for good status physical condition and good status flows and levels; • application of the criteria set out in national guidance to identify whether achievement of these standards would have a significant adverse effect on the benefits served by the modifications.

[19] http://www.gov.scot/Publications/2014/08/7219/downloads

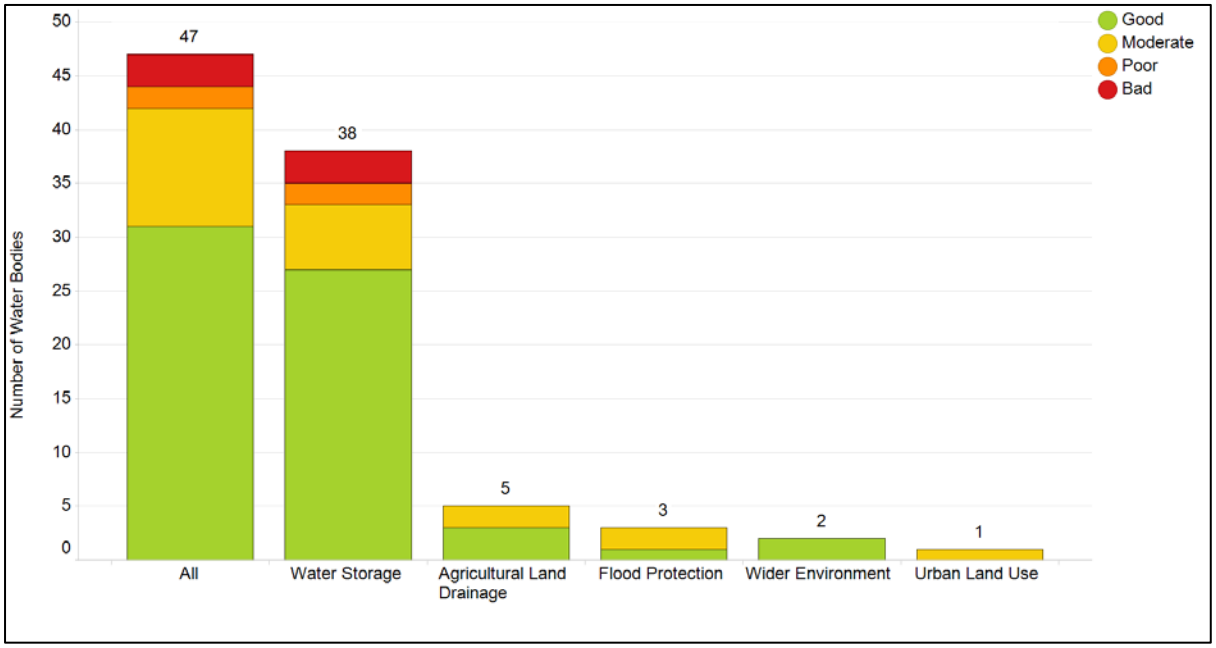
	For: • **Rural land drainage**
	• identification of the improvements required to achieve the standards set out in The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 or good status physical conditions; • application of the following criteria to identify whether achievement of these standards would have a significant adverse effect on the benefits served by the modifications: (i) the majority of the agricultural land benefiting from the modifications to the river (normally a combination of straightening and deepening) is prime agricultural land; (ii) the improvements to the water body that could be made without affecting prime agricultural land are very limited and would not be sufficient to achieve the conditions needed for good status. Prime agricultural land is land capable of producing high yields from at least a moderate range of crops according to our land capability for agriculture classification scheme.
	For: • **Other sustainable development – airports, roads or railways**
	• identification of the improvements required to achieve the standards set out in The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 for good status physical conditions; • application of the following criteria to identify whether achievement of these standards would have a significant adverse effect on the benefits served by the modifications: (i) the improvements required to achieve good ecological status would compromise the operation of a major airport or prevent the continued use of a major road or rail route.

4. Alternative means of securing the benefits of the modifications	
Criteria for designation as heavily modified	**How this was determined**
The benefits served by the modified characteristics cannot, for reasons of technical feasibility or disproportionate costs, be achieved by other means that are a significantly better option.	**For:** • **Water storage for hydroelectricity or drinking water supply** • **Urban land uses** • **Flood protection** • **Navigation - ports and harbours** • **Wildlife conservation**
	Assessment of other means of providing equivalent benefits as set out in national guidance. The other means considered included, where relevant, providing the benefits by means of modifications to other water bodies or by using means not involving modifications to water bodies.
	For: • **Rural land drainage**
	Assessment of whether the following conditions applied: • the agricultural production affected could not be substituted by the use of prime agricultural land elsewhere in Scotland as such land is already in production; • the land concerned could not be drained by other means that would allow restoration of the river without an equivalent adverse effect on agricultural production.
	Or: • **Other sustainable development – airports, roads or railways**
	Assessment of whether the following condition applied: • restoration of the water body to good status would require the relocation, of at least a significant part of an airport, major road or railway.

How we assessed the condition of heavily modified water bodies

Approach	Further details
We established and applied a framework of criteria and procedures to assess and classify the ecological potential of heavily modified and artificial water bodies.	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014
We also established set of environmental standards and associated assessment methods for application within the classification framework.	**Environmental standards** The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Assessment methods Biological assessment methods; Chemical assessment methods
Together with experts from across the UK, we developed a national library of mitigation measures and associated guidance to be taken into account in applying the classification framework.	**National library of mitigation measures:** The classification of ecological potential for heavily modified and artificial water bodies River flow for good ecological potential
To ensure our goals for the water environment do not significantly impact on the benefits provided by hydroelectricity generation, we set a limit on the associated reduction in hydroelectricity production between 2009 and 2027 of 100 gigawatt hours per year (around 2% of the hydroelectricity generated in Scotland in 2010).	**Ensuring the cumulative impacts of mitigation on hydroelectricity generation are not significant:** Implementing the Water Environment and Water Services (Scotland) Act 2003: Assessing Scotland's water environment – use of environmental standards, condition limits and classification schemes

Figure A8.1.2 Condition of heavily modified water bodies in the Scottish part of the Solway Tweed



Note to Figure A8.1.2
Water bodies with modifications serving more than one beneficial purpose feature in more than one of the bars in the figure.

Appendix 8.2: Further work to improve our understanding on pressures on the water environment

Our understanding of the pressures on the district's water bodies significantly increased over the period 2009 to 2015 but still needs improving. We will continue to expand our knowledge over the period 2015 to 2027. The better understanding this will provide is important to ensure our efforts to protect and improve the water environment are always targeted to best effect.

Impacts for which we need to identify the pressures responsible		
Impacts on plant and animal communities and on water quality		
Key gaps in understanding	• Pressures responsible where data show evidence of impact on the condition of aquatic plant or animal populations but we are uncertain why; • Pressures responsible where data show evidence of pollution but we are uncertain of the sources.	
Why filling the gaps is important	We cannot take the appropriate measures until we have identified the pressures responsible.	
	Number of water bodies with such impacts	48
Actions to fill them	During the period 2015 to 2021, we will carry out the investigations and research necessary to identify the pressures responsible.	

Pressures for which we need to improve our understanding of the extent of their impacts	
Pressures on water quality	
Key gaps in understanding	• Extent of pollution by hazardous substances from diffuse urban sources; • Extent of pollution from legacy sources of pollutants in contaminated ground.
Why filling the gaps is important	We may need to take additional action to achieve our objectives for some water bodies.
How big they are	There is evidence that a greater number of water bodies are likely to be adversely affected than our assessments in 2014 indicate.
Actions to be taken	During the period 2015 to 2021, we will carry out the monitoring and assessment work necessary to understand the extent of impacts and identify measures to address them.
Pressures on physical condition	
Key gaps in understanding	• Extent of pressures on the physical modifications of some rivers; • Extent of pressures on the physical condition of the sea bed from the use of bottom trawling gears.
What they mean	We may need to adjust where we take action in the period 2021 to 2027
How big they are	We have collected considerable information about physical modifications of all river water bodies. We have an ongoing programme of field survey work to that has already corrected and validated that information for a large number of water bodies. That programme has identified that the impact of some pressure can be overestimated and the impact of others underestimated in some water bodies.
Actions to fill them	During the period 2015 to 2021, we will carry out the monitoring and assessment work necessary to improve our understanding of the extent of impacts.

Pressures on flows and levels	
Key gaps in understanding	Extent of impacts from water flow or level changes close to the boundary between good and moderate conditions.
Why filling the gaps is important	It will help us confirm where action to improve flows and levels is required in the period 2021 to 2027.
How big they are	There are currently 29 river water bodies that are close to the boundary between good and moderate conditions.
Actions to fill them	During the period 2015 to 2021, we will develop and apply new and improved assessment methods to increase our understanding of the impact of pressures on flows and levels.

Pressures likely to increase over the period 2015 to 2027	
Changes in pressures resulting from climate change	
Key gaps	Early warning on where and when increases in pressures or their impacts as a result of climate change will be most significant.
Why filling them is important	Over the period 2015 to 2027, a key task of river basin management is to make sure we plan how to cope with effects of climate change on flows and levels, water quality and the spread of invasive non-native species.
How big they are	We know that there will be effects on the water environment from climate change. We are not certain about their scale and when and where they will be most severe.
Actions to fill them	During the period 2015 to 2027, we will continue to improve our understanding of the impact of climate change on the water environment.
Changes in pressures resulting from the expansion of aquaculture	
Key gaps	Understanding of the likely risks posed (including the risk to wild fish populations from infection with sea lice) by expansion of marine fish farming and how to manage them.
Why filling them is important	One of our key purposes for river basin management is to support and guide sustainable development. This requires information on risks to the water environment.
How big they are	Expansion of the aquaculture industry is likely and will provide important social and economic benefits. However, there are indications that in some locations fish farming can have adverse impacts on the water environment.
Actions to fill them	During the period 2015 to 2021, we will increase our understanding of the risks to the water environment that could result from a growing aquaculture sector and identify how those risks can be managed.

Appendix 8.3: Characterisation, monitoring and classification

This appendix is divided into three parts describing:

(a) characteristics of the river basin district;
(b) economic analysis of water use;
(c) monitoring and classification.

Detailed information about the characteristics of the district and about monitoring and classification is available on the **Water environment hub** or via the background documents referenced in this appendix. However, should you need help obtaining any information, please contact SEPA. SEPA's contact details and the associated procedures are described in Appendix 5.

Characteristics of the river basin district

This part of the appendix, together with the information referred to on the **Water environment hub**, provides a general description of the characteristics of the river basin district.

To help with the development of the plan, we undertook a major review of the district's characteristics in 2013 and set out the results in a report, *Current Condition and Challenges for the Future: Solway Tweed river basin district*. However, the process of reviewing and updating our assessments of pressures and impacts on the water environment has been ongoing throughout the period of 2009 to 2015 and will continue as our understanding improves and pressures shift and change.

Table A8.3.1: Location and boundaries of bodies of surface water

Summary of changes and updates since 2009 We have refined the boundaries of a number of bodies of surface water. This has included splitting some water bodies into more than one body to reflect our improving understanding of how the condition of the water environment varies from place to place. As a result, the number of bodes of surface water in the district has increased to 422 in 2015.					
Surface water category	**Coverage of water bodies**	**No. of water bodies**	**No. excluding heavily modified and artificial**	**No. heavily modified or artificial[1]**	**Location and boundaries**
River	• All watercourses or parts thereof in the district with a catchment area greater than 10km^2; • coastal streams with a catchment area of 10km^2 or less but which fulfil one or more of the criteria in UK guidance on the identification of small water bodies; • all small lakes connected to watercourses within the catchment of a river water body that do not meet the criteria below for identification as lake water bodies; • the main stem of each water body together with the network of tributary watercourses draining to that main stem.	379	343	36	**Water environment hub**
Lake (freshwater lochs)	• all lochs or parts thereof in the district with a surface area greater than 0.5km^2; • lochs with a surface area of 0.5 km^2 or less but which fulfil one or more of the criteria in UK guidance on the identification of small water bodies; • any short lengths of river that do not meet the criteria above for identification as a river water body that connect a lake water body to an estuary or coastal water body.	25	15	10	**Water environment hub**
Estuary (transitional)	• all estuaries or parts thereof in the district with a surface area greater than 0.5km^2 or a length longer than 1km; • estuaries with an area of 0.5km^2 or less and a length of 1km or shorter but which fulfil one or more of the criteria in UK guidance on the identification of small water bodies.	10	9	1	**Water environment hub**
Coastal water	• all coastal water in the district from mean high water spring tidal limit and a distance of three nautical miles seaward of the baseline from which UK territorial waters are measured.	8	8	0	**Water environment hub**
All		422	375	47	

Note to table A8.3.1: Further information on the identification of heavily modified and artificial water bodies is provided in Appendix 8.1

Table A8.3.2: Characterisation of surface water body types

Summary of changes and updates since 2009 We have not made any changes to the general characterisation of water body types we included in the first plan in 2009. However, we have refined the sub-types we use in defining reference values for hydromorphological, physicochemical, and biological reference conditions (see relevant sections below).					
Surface water category	**Ecoregion**	**System used to differentiate types**	**Criteria used to characterise types**	**No. of different types in the district**	**Mapping of types**
River	Great Britain	System A in accordance with UK guidance	• mean catchment altitude • catchment size • dominant geology	20	**Water environment hub**
Lake (freshwater lochs)	Great Britain	System B adapted in accordance with UK guidance	• latitude and longitude (ecoregion) • catchment geology • depth	16	**Water environment hub**
Estuary (transitional)	North Sea; Atlantic Ocean	System B in accordance with UK guidance	• latitude and longitude (ecoregion) • tidal range • salinity • mixing characteristics • mean substratum composition • wave exposure • depth	3	**Water environment hub**
Coastal water	North Sea; Atlantic Ocean	System B in accordance with UK guidance	• latitude and longitude (ecoregion) • tidal range • salinity (euhaline) • wave exposure	8	**Water environment hub**

Table A8.3.3: Establishment of hydromorphological and physicochemical reference conditions for bodies of surface water

Surface water body category	Condition	Types for which reference conditions identified	Reference conditions	Summary of changes and updates to reference conditions since 2009
Rivers; freshwater lochs; estuaries; coastal waters	Morphological conditions • physical condition of beds, banks and shores	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Standards for high status in Schedule 3 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 For coastal waters, the reference morphological conditions take account of modifications that would affect the direction of dominant currents. For estuaries and coastal waters, the reference morphological conditions take account of modifications that would affect wave exposure.	Revised for rivers, estuaries and coastal waters
Rivers; freshwater lochs	Hydrological regime • water flows and levels	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Standards for high status in Part B of Schedule2 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 For rivers, the reference conditions for water flows take account of the connection to bodies of groundwater (in terms of groundwater flow) expected under reference conditions.	Revised for loch water levels (review detail)
Rivers	River continuity • access for fish migration	All	Standards for high status in Schedule 3 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	No change

Table A8.3.3: Establishment of hydromorphological and physicochemical reference conditions for bodies of surface water continued

Surface water body category	Condition	Types for which reference conditions identified	Reference conditions	Summary of changes and updates to reference conditions since 2009
Estuaries	Tidal regime • freshwater flow	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Standards for good status in Schedule 3 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	No change
Rivers	General physicochemical conditions • oxygenation conditions • thermal conditions (temperature) • acidification status • nutrient conditions	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Standards for high status in Part C of Schedule 2 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	Revised for nutrient conditions (further detail) and acidification status (further detail)
	General physicochemical conditions • salinity	All	Reference conditions correspond to the observed mean salinity of the river water body concerned. This is because there are no pressures in the district that have more than very minor effects on the salinity of river water bodies.	No change

Table A8.3.3: Establishment of hydromorphological and physicochemical reference conditions for bodies of surface water continued

Surface water body category	Condition	Types for which reference conditions identified	Reference conditions	Summary of changes and updates to reference conditions since 2009
Freshwater lochs	General physicochemical conditions • oxygenation conditions • salinity • acidification status • nutrient conditions	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Standards for high status in Part C of Schedule 2 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	No change
Estuaries; coastal waters	General physicochemical conditions • oxygenation conditions • nutrient conditions	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Standards for high status in Part C of Schedule 2 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	No change
Coastal waters	General physicochemical conditions • salinity • thermal conditions	All	Reference conditions correspond to the observed mean salinity and mean temperature of the coastal water body concerned. This is because there are no pressures in the district that have more than very minor effects on the salinity or thermal conditions of coastal waters.	No change

Table A8.3.3: Establishment of hydromorphological and physicochemical reference conditions for bodies of surface water continued

Surface water body category	Condition	Types for which reference conditions identified	Reference conditions	Summary of changes and updates to reference conditions since 2009
Rivers; freshwater lochs; estuaries; coastal waters	Specific pollutants selected following peer review on the basis of nationally-established method which takes account of: • hazardous properties – the persistence, potential to bioaccumulate and toxicity; • potential environmental exposure – based on the level and pattern of use and/or on data from monitoring.	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Standards for high status or (if no standard for high status is specified) good status in Part C of Schedule 2 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 unless a separate standard for high status is specified. A standard for high status is only specified for ammonia in rivers and freshwater lochs. In all other cases, the standard for good equates to a no effects concentration identified by UK experts.	Revised for six pollutants and established for an additional 10 pollutants

Table A8.3.4: Cases where the establishment of hydromorphological or physicochemical reference conditions was not possible

Condition for which a reference value has not been established	Surface water category for which the reference value has not been established	Reason reference value has not been established	Implications for assessments of the condition of the water environment
Salinity	Estuaries	High degrees of natural variability mean that it was not possible to establish reliable reference conditions.	The salinity of estuaries could be significantly affected by changes to freshwater flow or tidal flow. The reference conditions we have established for freshwater flow and for physical condition ensure pressures that could affect salinity are reflected in our assessments of the condition of estuaries.

Condition for which a reference value has not been established	Surface water category for which the reference value has not been established	Reason reference value has not been established	Implications for assessments of the condition of the water environment
Transparency	Freshwater lochs; Estuaries; Coastal waters	High degrees of natural variability mean that it was not possible to establish reliable reference conditions.	Changes in transparency can be caused by: • an increase in the biomass of phytoplankton resulting from nutrient enrichment. The reference conditions we have established for nutrient conditions and for phytoplankton in lochs, estuaries and coastal waters ensure pollution by nutrients is reflected in our assessments of the condition of the water environment. • the release into the water of fine sediments (a) from the bed, banks or shores as a result of engineering works in water bodies; or (b) urban and rural land management, including construction, agriculture and forestry. Our programme of measures (see appendix 8.4) includes measures to control and minimise the risk of fine sediment releases as a result of such activities.
Thermal conditions	Estuaries	High degrees of natural variability mean that it was not possible to establish reliable reference conditions.	The thermal condition of estuaries could be affected by changes to freshwater flow or tidal flow. The reference conditions we have established for freshwater flow and for physical condition ensure pressures that could affect thermal condition are reflected in our assessments of the condition of estuaries.
	Freshwater lochs	We have been unable to identify an ecologically-relevant reference value for thermal conditions in lochs as a result of the difficulty in establishing a relationship between the condition of water plants and animals and the complex thermal structure created by temperature gradients.	The thermal condition of lochs could be significantly affected by water impoundment and consequent changes to water flows and levels. The reference conditions we have established for water levels and physical condition ensure that pressures that could affect the thermal condition of lochs are reflected in our assessments of the condition of the water environment.

Table A8.3.5: Establishment of reference conditions for plants and animals in rivers

Water plants or animals	Types for which reference conditions identified	Where the reference condition is defined	Summary of changes and updates to reference conditions since 2009
Larger rooted or floating plants (macrophytes)	All	River Assessment Method, Macrophytes and Phytobenthos, Phytobenthos – Diatoms for Assessing River and Lake Ecological Quality (River DARLEQ2)	Revised
Small, bottom-living algae (phytobenthos)	All	River Assessment Method, Macrophytes and Phytobenthos, Phytobenthos – Diatoms for Assessing River and Lake Ecological Quality (River DARLEQ2)	Revised
Bottom-living invertebrate animals	All	River Assessment Method, Benthic Invertebrate Fauna, Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT) An on-line version is available on SEPA's website	Revised
	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	River Assessment Method, Benthic Invertebrate Fauna, Invertebrates (Anthropogenic Acidification): WFD Acid Water Indicator Community (WFD-AWIC)	Revised
Fish	All	River Assessment Method, Fish Fauna, Fisheries Classification Scheme 2 (FCS2) Scotland	Revised

Table A8.3.6: Cases where biological reference conditions for rivers have not been established

Water plant or animal for which a reference value has not been established	Reason reference value has not been established	Implications for assessments of the condition of the water environment
Microscopic plants in the water column (phytoplankton)	High degrees of natural variability mean that it was not possible to establish reliable reference conditions. The district lacks the large, slow flowing rivers found in parts of continental Europe. Its relatively short, fast flowing rivers result in phytoplankton assemblages being absent or very short lived.	The reference conditions we have established for other water plants, physicochemical condition, river flows, and physical condition ensure that pressures that could affect any phytoplankton assemblages are reflected in our assessments of the condition of rivers.

Table A8.3.7: Establishment of reference plants and animals in freshwater lochs

Water plants or animals	Types for which reference conditions identified	Where the reference condition is defined	Summary of changes and updates to reference conditions since 2009
Microscopic plants in the water column (phytoplankton)	All	Lake Assessment Method, Phytoplankton, Phytoplankton Lake Assessment Tool with Uncertainty Module (PLUTO)	Revised
Larger rooted or floating plants (macrophytes)	All	Lake Assessment Method, Macrophytes and Phytobenthos, Macrophytes (Lake LEAFPACS2)	Revised
Small, bottom-living algae (phytobenthos)	All sub-types identified in Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Lake Assessment Method, Macrophytes and Phytobenthos, Phytobenthos – Diatoms for Assessing River and Lake Ecological Quality (Lake DARLEQ2)	Revised
Bottom-living invertebrate animals	All	Lake Assessment Method, Benthic Invertebrate Fauna, Chironomid Pupal Exuviae Technique (CPET)	Revised
	All sub-types identified Schedule 1 to the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 The sub-types collectively encompass all water bodies in the district.	Lake Assessment Method, Benthic Invertebrate Fauna, Lake Acidification Macroinvertebrate Metric (LAMM)	Revised

Table A8.3.8: Cases where biological reference conditions for lochs have not been established

Water plant or animal for which a reference value has not been established	Reason reference value has not been established	Implications for assessments of the condition of the water environment
Fish	We expect to establish reference conditions for fish in lochs and make assessments of the condition of fish in lochs during the period 2015 to 2021. The establishment of reference conditions was not completed in the period 2009 to 2015 because non-destructive techniques were insufficiently well developed.	The reference conditions we have established for other water plants, invertebrates, physicochemical condition, water levels, physical condition and invasive non-native species ensure that pressures that could affect fish are reflected in our assessments of the condition of lochs.

Table A8.3.9: Establishment of reference conditions for plants and animals in estuaries

Water plants or animals	Types for which reference conditions identified	Where the reference condition is defined	Summary of changes and updates to reference conditions since 2009
Microscopic plants in the water column (phytoplankton)	All	Transitional Water Assessment Method, Phytoplankton, Transitional Water Phytoplankton Tool	Newly established
Seaweeds (macroalgae)	All	Transitional Water Assessment Method, Macroalgae, Fucoid Extent Tool	Revised
	All	Transitional and Coastal Water Assessment Method, Macroalgae, Opportunistic Macroalgal Blooming Tool	Revised
Seagrasses (angiosperms)	All	Transitional and Coastal Water Assessment Method, Angiosperms, Intertidal Seagrass Tool	Newly established
Bottom-living invertebrate animals	All	Transitional and Coastal Water Assessment Methods, Benthic Invertebrate Fauna, Infaunal Quality Index	Newly established
Fish	All	Transitional Water Assessment Method, Fish Fauna, Transitional Fish Classification Index	Revised

Table A8.3.10 Establishment of reference conditions for plants and animals in coastal waters

Water plants or animals	Types for which reference conditions identified	Where the reference condition is defined	Summary of changes and updates to reference conditions since 2009
Microscopic plants in the water column (phytoplankton)	All	Coastal Water Assessment Method, Phytoplankton, Coastal Water Phytoplankton Tool	Revised
Seaweeds (macroalgae)	All	Transitional and Coastal Water Assessment Method, Macroalgae, Opportunistic Macroalgal Blooming Tool	Revised
		Coastal Water Assessment Method, Macroalgae, Macroalgae - Intertidal Rocky Shore Macroalgal Index	No change
Seagrasses (angiosperms)	All	Transitional and Coastal Water Assessment Method, Angiosperms, Intertidal Seagrass Tool	Newly established
Bottom-living invertebrate animals	All	Transitional and Coastal Water Assessment Methods, Benthic Invertebrate fauna, Invertebrates in Soft Sediments, Infaunal Quality Index	Revised
		Coastal Water Assessment Method, Benthic Invertebrate Fauna, Assessment of Imposex in Nucella Lapillus (Dog Whelks)	No change

Table A8.3.11: Identification of significant pressures on bodies of surface water

Summary of changes and updates since 2009 Over the period 2009 to 2015, we have improved our understanding of pressures and their impacts on bodies of surface waters. Among the reasons for this was the availability of a further six years of targeted environmental monitoring and developments in scientific knowledge of the environmental standards needed to protect aquatic plant and animals.			
Pressures are identified as significant where they: • have contributed to a breach of an environmental standard for good; • are contributing to a risk that an environmental standard will be breached (e.g. contributing to an upward trend in the concentration of pollutants). Information on all significant pressures and their impacts is included in the **Water environment hub** in the data maintained on each water body. Appendix 8.2 identifies some of the work we will be doing over the period 2015 to 2021 to further improve our understanding of pressures on the water environment.			
Type of pressure	**Sources of information collected and held on the location and magnitude of pressure**	**Assessment of the effect of pressures** (including cumulatively)	**Assessment of the significance of pressures** (including cumulatively)
Point source discharges	• Location and permitted pollutant content of discharges specified in the authorisations for those discharges • Pollutant emission data supplied by operators of discharges as a condition of authorisation • Audits of compliance with authorisation conditions by regulators • Pollution emission data supplied for the purposes of the Scottish Pollutant Release Inventory • Chemical investigation programmes in relation to waste water discharges • Investigations to identify the sources of pollutants found in environmental monitoring results	Environmental monitoring of pollutant concentrations supplemented by water quality modelling and trend analyses	Application of the relevant standards for physicochemical conditions and water plants and animals specified in the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
Diffuse source pollution	• Land use data combined with loading estimates for different land uses based on national research programme results • Surveys of land management practices • National pesticide usage surveys	Environmental monitoring of pollutant concentrations supplemented by water quality modelling and trend analyses	Application of the relevant standards for physicochemical conditions and water plants and animals specified in the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014

Table A8.3.11: Identification of significant pressures on bodies of surface water continued

Type of pressure	**Sources of information collected and held on the location and magnitude of pressure**	**Assessment of the effect of pressures** (including cumulatively)	**Assessment of the significance of pressures** (including cumulatively)
Water abstraction and flow regulation	• Location and rate of permitted abstractions specified in the authorisations for all abstractions of > $10m^3$ per day • Actual rate of abstraction supplied by operators of large abstractions as a condition of authorisation • Location and operating requirements specified in authorisations required for all impounding works • Audits of compliance with authorisation conditions by regulators • Location of abstractions of less than $10m^3$ per day for private supplies	Water flow and level modelling, taking account of information on the location and rates of abstraction, the results of rainfall and water flow and level monitoring – this includes information from the network of river flow gauging stations maintained by SEPA	Application of the relevant standards for flows and levels and water plants and animals specified in the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
Modifications to physical condition	• Remote sensing surveys • Field surveys • Details specified in authorisations for all modifications that have been made between 2005 and 2015 • Audits of compliance with authorisation conditions by regulators	Use of the information collected on all modifications to determine morphological condition values for each water body in accordance with the method set out in the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	Application of the standards for morphological condition specified in the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
Barriers to fish migration	• Location of authorised weirs and dams lacking provision for fish migration • Audits of compliance with authorisation conditions by regulators • Identification of other structures based on assessments by public bodies and by members of the Rivers and Fishery Trusts of Scotland	Assessment of the pass-ability of the structures to fish using national guidance /fish monitoring results	Application of the standards for river continuity / fish specified in the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
Invasive non-native species	• Public body environmental monitoring programmes and surveys • Information collected by voluntary organisations, research institutes	Risk assessments undertaken by the Great Britain Non-Native Species Secretariat Environmental monitoring programmes and surveys	Application of the criteria specified in the Solway Tweed River Basin District (Status) (Scotland) Directions 2014

Notes to table A8.3.11:

1. References to authorisations mean the authorisations required under the controls identified in our programmes of measures (see Appendix 8.4).
2. Further information on authorisation requirements and compliance assessment for the main controls is available on SEPA's website and on the Scottish Government's website.
3. The environmental standards, including the biological standards, used to assess whether pressures are significant were reviewed and updated during the period 2009 to 2015.
4. Information on land use patterns (e.g. see Scotland's environment web; Land capability classification for agriculture; etc.) has been taken into account in assessments in various ways, including in estimating diffuse pollution pressures and identifying where pressures are likely to increase as a result of demographic changes or shifts in land use management practices.

Table A8.3.12: Assessment of impact on bodies of surface water

1. Identification of water bodies that are not at good status	
Approach	**Further details**
(a) We established and applied a framework of criteria and procedures to assess and classify the condition of all water bodies of surface water.	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014
(b) We established a set of environmental standards and associated assessment methods for application within the classification framework.	**Environmental standards** The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Assessment methods Biological assessment methods Chemical assessment methods
(c) We applied the framework to the results of environmental monitoring and modelling to classify the condition of all bodies of surface water and identify those that are not in a good condition.	Results for each water body are available on the **Water environment hub**
2. Identification of risks of deterioration	
(d) Analysis of monitoring data to identify any trends in the concentration of pollutants that, if unaddressed could breach an environmental standard. (e) Analysis of proximity of water bodies to established populations of invasive non-native species and the associated risk of invasion if the spread of the species is not prevented.	Information on water bodies identified as at risk is available on the **Water environment hub**

Table A8.3.13: Characterisation of groundwaters

<table>
<tr><th colspan="4">1. Location and boundaries of bodies of groundwater</th></tr>
<tr><td colspan="4">Outcome of review
For the second plan, we reviewed and substantially revised the location and boundaries of bodies of groundwater to take account of our latest understanding of the characteristics of groundwater. The revisions resulted in an increase in the number of bodies of groundwater in the district to 59.

Information on the location and boundaries of the bodies of groundwater is available on the Water environment hub.</td></tr>
<tr><th>Summary of approach</th><th colspan="2">Aquifer type</th><th>Number of bodies of groundwater</th></tr>
<tr><td rowspan="10">The revised boundaries were identified by:

• assigning groundwater to aquifer types reflective of groundwater flow characteristics and natural chemistry;
• sub-dividing individual aquifers further (i.e. into more than one water body) where necessary to reflect differences in pressure on, or vulnerability of, different parts of the aquifers. Where aquifers were subdivided, the boundaries of the resulting water bodies follow surface water catchment boundaries or geological and structural features, such as faults and folds.

The approach included separation of bodies of groundwater into two layers: a shallow layer of superficial water bodies and a thicker layer of bedrock water bodies.

Further information on the approach is available in, Scotland’s aquifers and groundwater bodies published by the British Geological Society.</td><td colspan="2">All</td><td>59</td></tr>
<tr><td rowspan="8">Bedrock</td><td>Permo-Triassic</td><td>7</td></tr>
<tr><td>Carboniferous – not extensively mined for coal</td><td>8</td></tr>
<tr><td>Carboniferous – extensively mined for coal</td><td>2</td></tr>
<tr><td>Old Red Sandstone South</td><td>6</td></tr>
<tr><td>Silurian-Ordovician</td><td>14</td></tr>
<tr><td>Igneous volcanic</td><td>2</td></tr>
<tr><td>Igneous intrusive</td><td>3</td></tr>
<tr><td>Igneous/sedimentary</td><td>1</td></tr>
<tr><td>Superficial</td><td></td><td>16</td></tr>
</table>

Table A8.3.13: Characterisation of groundwaters continued

2. Information on the characteristics of bodies of groundwater, including the pressures to which they are subject	
Outcome of review For the second plan we have improved our understanding of the natural characteristics of bodies of groundwater and the pressures to which they are subject.	
Characteristic	**Source of information**
Geological characteristics (aquifer type)	Scotland's aquifers and groundwater bodies
Hydrological characteristics	Scotland's aquifers and groundwater bodies
Natural chemistry	Scotland's aquifers and groundwater bodies
Annual recharge	**Water environment hub**
Overlying strata (and vulnerability to pollution)	**Water environment hub**
Dependent surface water bodies and wetlands	**Water environment hub**
Pressures to which groundwater body is subject	• Information is maintained by SEPA on the location and rates of abstraction of groundwater in copies of the authorisations required for all abstractions of $10m^3$ per day or more. • Diffuse sources of pollution have been identified using information on land use, the characteristics of the overlying strata and groundwater monitoring results. • Pollutant inputs from sources in contaminated ground have been identified using information on past land uses, surveys of land quality and groundwater monitoring. • Legacy impacts from abandoned underground mines have been identified using information from environmental monitoring programmes. • Information on all pressures contributing to a body of groundwater being in poor status or to a significant and sustained upward trend in pollutant concentrations is available on the **Water environment hub.**
Connection to surface waters	The flow between groundwater and surface waters is taken into account in low flow models for associated bodies of surface water.

Table A8.3.14: Assessment of impact on bodies of groundwater

1. Identification of water bodies in a poor condition	
Approach	**Further details**
(a) We established and applied a framework of criteria and procedures to assess and classify the condition of all bodies of groundwater.	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014
(b) We established a set of threshold values for use in helping to identify bodies of groundwater that may be at poor status. We reviewed and updated the threshold values during the period 2009 to 2015.	Threshold values The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
(c) We identified where the threshold values were exceeded using the results of monitoring and modelling. (d) Where we identified that a threshold value was exceeded, we carried out investigations and applied the criteria in the classification framework to determine whether the water body was in a good or poor condition.	In 2015, 16 bodies of groundwater in the district were identified as being in a poor condition. Further details for each water body are available on the **Water environment hub**
2. Identification of risks of deterioration	
(e) We analysed monitoring data from bodies of groundwater to identify any significant and sustained upward trends in the concentration of pollutants in groundwater.	Further information on the water bodies concerned is available on the **Water environment hub**

Economic analysis of water use

This part of the appendix provides a summary of our economic analysis of water use

Table A8.3.15: Information to make the calculations necessary for recovering the costs of water services

Scottish Water:

- provides water-supply services (abstraction, impoundment, storage, treatment and distribution of surface water and groundwater) to household customers;
- provides waste water services (waste water collection and treatment facilities discharging into rivers, lochs, estuaries or coastal waters) to household customers;
- acts as the wholesaler of water supply and waste water services in the competitive market for businesses, public sector bodies and not-for-profit organisations.

Scottish Water is a publicly-owned business with over five million customers in nearly 2.5 million households across Scotland.

To maintain and improve water services, Scottish Ministers have established an investment programme funded by customer charges, known as the Quality and Standards (Q&S) programme. The objectives of the programme are set by Scottish Ministers following public consultation. Scottish Water is responsible for achieving the objectives of the programme. Before the programme is finalised:

- Scottish Water assesses what it needs to do to meet the objectives and how much this would cost;
- The Water Industry Commission for Scotland scrutinises Scottish Water's assessments, including the scope of the solutions considered and the efficiency with which Scottish Water proposes to deliver them. The Water Industry Commission for Scotland is the independent economic regulator of water and sewerage services in Scotland.

The cost of maintaining water services includes the cost of protecting the water environment. The cost of improving water services includes the cost of reducing the adverse impacts of water services on the water environment in order to achieve the objectives of this river basin management plan.

The estimated costs of water services for the period 2015 to 2021 are published in the Scottish Water delivery plan.

Information to calculate the cost of maintaining water services

- For the investment programme for the period, 2015 to 2021, Scottish Water estimated maintenance costs using asset (i.e. treatment works, pumping stations, sewers, water pipes, etc.) management modelling techniques and detailed assessments.
- The models and assessments took account of projected future demand for water services.

Information to calculate the cost of improving water services

To collect sufficient information to calculate the cost of improving water services in the period 2015 to 2021:

- SEPA and Scottish Water worked together during the period 2009 to 2015 to quantify the contribution made by water services to adverse impacts on the water environment relative to the contributions from other pressures on the water environment, such as rural diffuse pollution.
- During the same period, Scottish Water estimated the cost of addressing the contributions of water services to achieve the objectives set for the water environment in the period 2015 to 2021. This involved undertaking detailed studies to identify the most cost-effective options for addressing the impacts of water services.
- The studies included consideration of long-term forecasts of supply and demand to ensure the lowest cost whole-life solutions were identified.
- During the period 2015 to 2021, Scottish Water will complete the studies necessary to identify the most cost-effective solutions for making the improvements required to achieve the objectives we have set for 2027.

Information on users of water services necessary for making the calculations necessary for recovering costs

- Public water supply to business premises is metered.
- Scottish Water estimates that, for households, the average daily water usage per person is 150 litres.
- All significant trade effluent discharges to Scottish Water's network of waste water collection sewers require authorisation from Scottish Water under the Sewerage (Scotland) Act. The authorisations set limits on the volume and nature of the discharges.

Table A8.3.16: Information to make judgements about the most cost effective combination of measures included in the programme of measures

The principal controls on water uses included in the programme of measures have been specifically designed to enable the cost-effective protection and improvement of the water environment.

Cost-effective protection
The controls cover any water use posing a risk to the water environment and their tiered, risk-proportionate structure ensures that:

- activities posing the greatest risk are identified by the regulator and subject to a commensurate level of regulatory control - in terms of both conditions of authorisation and scrutiny;
- cumulative risks from concentrations of individually lower risk activities are identified by the regulator and appropriately addressed;
- unnecessary regulatory burdens on businesses are avoided.

The water uses covered include:
- any activity liable to cause pollution, including those resulting in diffuse sources of pollution;
- water abstraction;
- the construction, alteration and operation of impounding works;
- any other building or engineering works in the water environment or in the vicinity of the water environment and likely to have a significant adverse impact on it;
- the direct or indirect into groundwater of any pollutant;
- any other activity which directly or indirectly is likely to have a significant adverse impact on the water environment.

Cost-effective improvement
The comprehensive range of water uses subject to control enables the regulator to:
- target problems effectively, taking account of the interaction between pressures; the most appropriate sequencing of action to address them; and opportunities for maximising wider social and economic benefits;
- ensure equitable and proportionate contributions are made by those responsible for the water uses concerned.

Once the required contribution has been identified by the regulator, the controls are designed and operated to allow the businesses responsible to use their expertise and innovation to identify the most cost-effective options for making their contributions.

Where the business concerned is Scottish Water, the economic regulator scrutinises its assessments (see table A8.3.15 above). For other businesses, the environmental regulator scrutinises the assessments where the business believes that there are no feasible or proportionate options for adequately addressing the impact.

Information used in making the judgements required:

Impact on the water body; the pressures responsible; and the scale of improvement required	• See Part 1 and Part 3 of this appendix • Summarised in **Water environment hub** *(impacts and pressures responsible)*
Businesses/sectors responsible for the pressures	• Authorisation information • Land use data • Investigations • Summarised in **Water environment hub** *(business sectors responsible for pressures)*
Where there are multiple contributions to an impact, the proportion of the impact attributable to each	• Environmental modelling, including source apportionment modelling • Source investigations

Opportunities for maximising wider benefits	• National and local plans, including flood risk management plans • Local consultations • Benefit assessments, such as ecosystem services assessments
Measure options	• Option appraisal studies • Advice, guidance and other expertise sharing.

Monitoring and classification

This part of the appendix, together with the information referred to on the **Water environment hub**, provides information on our monitoring programmes and on how we assess and classify the condition of the water environment.

Table A8.3.17: Establishment and implementation of monitoring programmes

Establishment of programmes of monitoring	Water Environment and water Services (Scotland) Act 2003
Content of the programmes	The water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013
Responsibility for preparing programmes	SEPA
Responsibility for carrying out or securing the carrying out of the programmes	SEPA
Date that programmes first commenced	22 December 2006
Contact point for obtaining monitoring data gathered through the monitoring programmes. For information on the procedures for doing so, see Appendix 5.	SEPA

Table A8.3.18: Monitoring networks

The initial monitoring programmes for the purposes of the river basin management plan were established at the end of 2006. Information on the establishment of the programmes was published in an aquatic monitoring strategy for the district. The programmes are designed on the basis of: • assessments of risk to our objectives for the water environment. These assessments take account of the results of monitoring programmes and analyses of information on pressures (see Part 1 of this appendix); • information on when and where measures are being taken for the purposes of improving the condition of the water environment; • reports of accidental pollution. The initial programmes have been reviewed and updated on an annual basis accordingly. The programmes will be comprehensively reviewed and revised during the period 2015 to 2021. In particular, the revisions will ensure the effectiveness of the measures taken under this plan to improve the condition of water bodies and protected areas is monitored and assessed.

Table A8.3.18: Monitoring networks continued

Water category	Type of programme	Main purposes of programme	Summary of action planned for 2015-2021	Maps of monitoring networks
Surface waters and ground-water	Surveillance	• Supplementing and validating impact assessments and informing the design of future monitoring programmes • Assessing long-term changes, including those resulting from widespread human activities	During the period 2009 to 2015, we: • developed improved models of the impact of point and diffuse source pollution on river water quality; • established the status of water bodies across the district. During the period 2015 to 2021, we will amend the monitoring network to shift effort from water bodies where we have established status to: • supplementing and validating the outputs of our water quality models; • identifying and assessing emerging risks.	Water environment hub
	Operational	• Assessing the condition of water bodies that are under pressure • Assessing changes resulting from actions taken to improve or protect the condition of water bodies • Establish the presence of any long-term trends in the concentration of pollutants	We will amend the network during the period 2015 to 2021 in order to: • assess changes resulting from the programme of measures established in this plan; • improve understanding of the impacts of pressures (see Appendix 8.2).	Water environment hub
	Investigative	• Identifying the cause of impacts where these are not known • Ascertaining the magnitude and impacts of accidental pollution • Improving understanding of the impacts of pressures	Where appropriate, we will use investigative monitoring during the period 2015 to 2021 to help improve our understanding of pressure and impacts - including in particular the improvements highlighted as needed in Appendix 8.2.	Dynamic and highly variable and hence not mapped

Table A8.3.18: Monitoring networks continued

Water category	Type of programme	Main purposes of programme	Summary of action planned for 2015-2021	Maps of monitoring networks
Ground-water	Level monitoring	• Assessing the quantitative status of bodies of groundwater • Identifying the available groundwater resource	We will amend the network during the period 2015 to 2021 in order to assess changes resulting from the programme of measures established in this plan.	**Water environment hub**
Protected areas	Specific programmes for protected areas are designed. These are integrated with the monitoring programmes outlined above wherever possible. Monitoring of wildlife protected areas that are at risk of not achieving their objectives is included in the operational monitoring programmes for the water bodies concerned.	• Assessing the condition of protected areas • Identifying risks to the achievement of the protected areas objectives • Assessing the effectiveness of the measures taken to achieve the objectives for the areas	We will amend the network during the period 2015 to 2021 in order to assess changes resulting from the programme of measures established in this plan.	**Water environment hub**

Table A8.3.19: Assessment of the condition of the water environment

An overview of our approach to assessing the condition of the water environment is set out in Assessing Scotland's water environment – use of environmental standards, condition limits and classification schemes

Condition	Assessment framework	Environmental standards or threshold values applied	Map of the results of monitoring programmes	Detailed results per water body, including level of confidence in results
Surface waters - ecological status	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014 Specifications for chemical analysis and monitoring: The Chemical Analysis of Water Status (Technical Specifications) (Scotland) (N0. 2) Directions 2011	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	**Water environment hub**	**Water environment hub**
Surface waters – ecological potential	See Appendix 8.1 Specifications for chemical analysis and monitoring: The Chemical Analysis of Water Status (Technical Specifications) (Scotland) (N0. 2) Directions 2011	See Appendix 8.1	**Water environment hub**	**Water environment hub**
Surface water bodies that are not in good status or good potential because of the concentration of a specific pollutant	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014 Specifications for chemical analysis and monitoring: The Chemical Analysis of Water Status (Technical Specifications) (Scotland) (N0. 2) Directions 2011	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	**Water environment hub**	**Water environment hub**

Table A8.3.19: Assessment of the condition of the water environment continued

Condition	Assessment framework	Environmental standards or threshold values applied	Map of the results of monitoring programmes	Detailed results per water body, including level of confidence in results
Surface waters - chemical status	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014 Specifications for chemical analysis and monitoring: The Chemical Analysis of Water Status (Technical Specifications) (Scotland) (N0. 2) Directions 2011	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	**Water environment hub**	**Water environment hub**
Groundwater – quantitative status	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	**Water environment hub**	**Water environment hub**
Groundwater – chemical status	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	**Water environment hub**	**Water environment hub**
Long-term trends in concentration of priority substances	The Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013 Specifications for chemical analysis and monitoring: The Chemical Analysis of Water Status (Technical Specifications) (Scotland) (N0. 2) Directions 2011	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	No trends identified by 2015. A longer period of monitoring may be required to identify any trends.	
Groundwater – trends in pollutant concentrations	The Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013	The starting point for trend reversal is where concentrations reach 75% of any threshold values established in the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014	**Water environment hub**	**Water environment hub**

Table A8.3.19: Assessment of the condition of the water environment continued

Condition	Assessment framework	Environmental standards or threshold values applied	Map of the results of monitoring programmes	Detailed results per water body, including level of confidence in results
Achievement of protected areas objectives	See Appendix 1	See Appendix 1	Water environment hub	Water environment hub

Table A8.3.20: Information on methodologies used for monitoring the impact of pressures on rivers

Pressure		Principal indicators of impact used	Method used, including, where applicable, information on the taxonomic level required and the calculation of confidence
Pressures on water quality – pollution	Nutrient enrichment	Larger rooted or floating plants (macrophytes)	River Assessment Method, Macrophytes and Phytobenthos, Phytobenthos – Diatoms for Assessing River and Lake Ecological Quality (River DARLEQ2)
		Small, bottom-living algae (phytobenthos)	River Assessment Method, Macrophytes and Phytobenthos, Phytobenthos – Diatoms for Assessing River and Lake Ecological Quality (River DARLEQ2)
		Reactive phosphorus concentrations	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Organic enrichment	Bottom-living invertebrate animals	River Assessment Method, Benthic Invertebrate Fauna, Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT)
		Bacterial tufts	River Assessment Method, Macrophytes and Phytobenthos, Phytobenthos – Diatoms for Assessing River and Lake Ecological Quality (River DARLEQ2)
		Dissolved oxygen concentrations Biochemical oxygen demand	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Acid deposition	Bottom-living invertebrate animals	River Assessment Method, Benthic Invertebrate Fauna, Invertebrates (Anthropogenic Acidification): WFD Acid Water Indicator Community (WFD-AWIC))
		Fish	River Assessment Method, Fish Fauna, Fisheries Classification Scheme 2 (FCS2) Scotland
		pH and acid neutralising capacity	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Thermal discharges	Fish	River Assessment Method, Fish Fauna, Fisheries Classification Scheme 2 (FCS2) Scotland
		Water temperature	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014

Table A8.3.20: Information on methodologies used for monitoring the impact of pressures on rivers continued

Pressure		Principal indicators of impact used	Method used, including, where applicable, information on the taxonomic level required and the calculation of confidence
Pressures on water quality – pollution	Point and diffuse inputs of toxic pollutants	Bottom-living invertebrate animals	River Assessment Method, Benthic Invertebrate Fauna, Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT)
		Concentrations of specific pollutants and priority substances	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
Modifications to physical condition		Morphological condition	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Fish	River Assessment Method, Fish Fauna, Fisheries Classification Scheme 2 (FCS2) Scotland
Barriers to fish migration		River continuity condition	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Fish	River Assessment Method, Fish Fauna, Fisheries Classification Scheme 2 (FCS2) Scotland
Water abstraction and impoundment		River flows	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Ecological indicators	River Assessment Method, Ecological indicators of severe water resources pressures
Invasive non-native species		Invasive species	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014
		Other biological assessment methods listed above, as appropriate	

Table A8.3.21: Information on methodologies used for monitoring the impact of pressures on freshwater lochs

Pressure		Principal indicators of impact used	Method used, including, where applicable, information on the taxonomic level required and the calculation of confidence
Pressures on water quality - pollution	Nutrient enrichment	Microscopic plants in the water column (phytoplankton)	Lake Assessment Method, Phytoplankton, Phytoplankton Lake Assessment Tool with Uncertainty Module (PLUTO)
		Larger rooted or floating plants (macrophytes)	Lake Assessment Method, Macrophytes and Phytobenthos, Macrophytes (Lake LEAFPACS2)
		Small, bottom-living algae (phytobenthos)	Lake Assessment Method, Macrophytes and Phytobenthos, Phytobenthos – Diatoms for Assessing River and Lake Ecological Quality (River DARLEQ2)
		Bottom-living invertebrate animals	Lake Assessment Method, Benthic Invertebrate Fauna, Chironomid Pupal Exuviae Technique (CPET)
		Concentrations of total phosphorus	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Dissolved oxygen concentrations	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Acid deposition	Bottom-living invertebrate animals	Lake Assessment Method, Benthic Invertebrate Fauna, Lake Acidification Macroinvertebrate Metric (LAMM)
		Acid neutralising capacity	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Point and diffuse inputs of toxic pollutants	Concentrations of specific pollutants and priority substances	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
Modifications to physical condition		Morphological condition	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Larger rooted or floating plants (macrophytes)	Lake Assessment Method, Macrophytes and Phytobenthos, Macrophytes (Lake LEAFPACS2)
Water abstraction and impoundment		Water levels	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Morphological condition	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Larger rooted or floating plants (macrophytes)	Lake Assessment Method, Macrophytes and Phytobenthos, Macrophytes (Lake LEAFPACS2)
Invasive non-native species		Invasive species	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014
		Other biological assessment methods listed above, as appropriate	

Table A8.3.22: Information on methodologies used for monitoring the impact of pressures on estuaries

Pressure		Principal indicators of impact used	Method used, including, where applicable, information on the taxonomic level required and the calculation of confidence
Pressures on water quality - pollution	Nutrient enrichment	Microscopic plants in the water column (phytoplankton)	Transitional Water Assessment Method, Phytoplankton, Transitional Water Phytoplankton Tool
		Seaweeds (macroalgae)	Transitional and Coastal Water Assessment Method, Macroalgae, Opportunistic Macroalgal Blooming Tool
		Seagrasses (angiosperms)	Transitional and Coastal Water Assessment Method, Angiosperms, Intertidal Seagrass Tool
		Concentrations of inorganic nitrogen	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Concentration of dissolved oxygen	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Organic enrichment	Bottom-living invertebrate animals	Transitional and Coastal Water Assessment Methods, Benthic Invertebrate Fauna, Infaunal Quality Index
		Concentration of dissolved oxygen	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Point and diffuse inputs of toxic pollutants	Concentrations of specific pollutants and priority substances	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Bottom-living invertebrate animals	Transitional and Coastal Water Assessment Methods, Benthic Invertebrate Fauna, Infaunal Quality Index
		Seaweeds (macroalgae)	Transitional Water Assessment Method, Macroalgae, Fucoid Extent Tool
Physical condition, including tidal regime and freshwater flow		Morphological condition	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Freshwater flow condition	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Bottom-living invertebrate animals	Transitional and Coastal Water Assessment Methods, Benthic Invertebrate Fauna, Infaunal Quality Index
		Seagrasses (angiosperms)	Transitional and Coastal Water Assessment Method, Angiosperms, Intertidal Seagrass Tool
		Fish	Transitional Water Assessment Method, Fish Fauna, Transitional Fish Classification Index
Invasive non-native species		Invasive species	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014
		Other biological assessment methods listed above, as appropriate	

Table A8.3.23: Information on methodologies used for monitoring the impact of pressures on coastal waters

Pressure		Principal indicators of impact used	Method used, including, where applicable, information on the taxonomic level required and the calculation of confidence
Pressures on water quality - pollution	Nutrient enrichment	Microscopic plants in the water column (phytoplankton)	Coastal Water Assessment Method, Phytoplankton, Coastal Water Phytoplankton Tool
		Seaweeds (macroalgae)	Transitional and Coastal Water Assessment Method, Macroalgae, Opportunistic Macroalgal Blooming Tool
			Coastal Water Assessment Method, Macroalgae, Macroalgae - Intertidal Rocky Shore Macroalgal Index
		Seagrasses (angiosperms)	Transitional and Coastal Water Assessment Method, Angiosperms, Intertidal Seagrass Tool
		Concentrations of inorganic nitrogen	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Concentration of dissolved oxygen	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Organic enrichment	Bottom-living invertebrate animals	Transitional and Coastal Water Assessment Methods, Benthic Invertebrate Fauna, Infaunal Quality Index
		Concentration of dissolved oxygen	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
	Point and diffuse inputs of toxic pollutants	Concentrations of specific pollutants and priority substances	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Bottom-living invertebrate animals	Transitional and Coastal Water Assessment Methods, Benthic Invertebrate Fauna, Infaunal Quality Index
			Coastal Water Assessment Method, Benthic Invertebrate Fauna, Assessment of imposex in Nucella lapillus (dog whelks)
Physical condition, including tidal regime		Morphological condition	The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014
		Bottom-living invertebrate animals	Transitional and Coastal Water Assessment Methods, Benthic Invertebrate Fauna, Infaunal Quality Index
		Seagrasses (angiosperms)	Transitional and Coastal Water Assessment Method, Angiosperms, Intertidal Seagrass Tool
Invasive non-native species		Invasive species	The Solway Tweed River Basin District (Status) (Scotland) Directions 2014
		Other biological assessment methods listed above, as appropriate	

Table A8.3.24: Threshold values for assessing groundwater chemical status – 1

The threshold values set out in this table and table A8.3.27 are established in the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014

The changes and additions made to the threshold values during the period 2009 to 2015 are described in Updated recommendations on Environmental Standards, River Basin Management (2015 to 2021), published by the UK Technical Advisory Group on the Water Framework Directive.

Pollutant or indicator of pollution	Unit of measurement and associated assessment statistic	Risk indicated by a failure of the threshold value			
		Threshold values indicative of risks to the ecological or chemical quality of an associated surface water	Threshold values indicative of risks to the quality of water being abstracted, or intended to be abstracted, for human consumption[(i)]	Threshold values indicative of risks of saline intrusion	Threshold values indicative of other significant environmental risks including those affecting the ability of groundwater to support human uses
Electrical conductivity	Mean conductivity (micro-Siemens/cm)			1,000	1,000[(ii)]
Atrazine	Mean concentration (µg/l)		0.075		0.075
Benzo(a)pyrene	Mean concentration (µg/l)				0.0075
Chromium (total)	Mean concentration (µg/l)				37.5
Dichloromethane	Mean concentration (µg/l)				1.5
Epoxyconazole	Mean concentration (µg/l)				0.075
Mecoprop	Mean concentration (µg/l)				0.075
Nitrate	Mean concentration (mg/l)	18[(ii)]	37.5		37.5
Simazine	Mean concentration (µg/l)				0.075
Tetrachloroethene	Mean concentration (µg/l)				7.5
Tricholoethane	Mean concentration (µg/l)				7.5
Any other pollutant	As specified in Part C of Schedule 2 of the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014 for the relevant chemical standard for the pollutant in the applicable surface water	Breach of a chemical environ-mental standard for the pollutant in an associated surface water			
	Mean concentration (µg/l)				0.75 x maximum admissible concentration for the relevant drinking water standard[(iv)]

Note to table A8.3.24:
For the purpose of assessing risks to the quality of water being abstracted, or intended to be abstracted, for human consumption, the relevant thresholds apply to groundwater representative of the quality of the water being abstracted or intended to be abstracted.

For the purpose of assessing other significant risks, the relevant electrical conductivity threshold value must be applied for the purposes of assessing the impact of mining on the chemical status of bodies of groundwater.

For the purposes of assessing risks to the ecological or chemical quality of associated surface waters, the relevant threshold value for nitrate is applicable only where there is an associated failure of a nitrogen-related standard in an associated surface water.

This includes relevant standards set under the Water Supply (Water Quality) (Scotland) Regulations 2001 and the Private Water Supplies (Scotland) Regulations 2006 (as amended or re-enacted from time to time).

Table A8.3.25: Threshold values for assessing groundwater chemical status – 2

Pollutant or indicator of pollution	Unit of measurement and associated assessment statistic	Groundwater dependent wetland type	Threshold values indicative of risks to the quality of groundwater dependent wetlands	
			Altitude of wetland above sea level (metres)	
			≤ 175	> 175
Nitrate	Annual mean concentration (mg/l NO_3) in groundwater on which the wetland depends	Quaking bog	18	4
		Wet woodland	22	9
		Wet dune	13	13
		Fen (mesotrophic) and fen meadow	22	9
		Fen (oligotrophic) and wetland at tufa forming springs	20	4
		Wet grassland	26	9
		Wet heath	13	9
		Peatbog and woodland on peatbog	9	9
		Wetland directly irrigated by spring or seepage	9	9
		Swamp (oligotrophic)	18	18
		Swamp (mesotrophic) and reedbed	22	22

Note to table A8.3.25:
For the purpose of groundwater chemical status assessment, the above threshold values apply where:

(i) the wetland concerned is significantly damaged;
(ii) the characteristics of the damage are such that it may be due to nitrate reaching the wetland via groundwater

For information on wetland types, see the Solway Tweed River Basin District (Standards) (Scotland) Directions 2014

Table A8.3.26: Background information on the establishment of threshold values for assessing groundwater chemical status

Background information topic	Where information can be accessed
How EU guidelines have been followed in setting threshold values	Annex 1 of the Groundwater chemical classification for the purposes of the Water Framework Directive and the Groundwater Directive, published by the UK Technical Advisory Group on the Water Framework Directive
Application of the threshold values	The values have been established at national level and apply to all bodies of groundwater in the district
The relationship between the threshold values and background levels; other standards for the water protection; information on hazardous properties and dispersion tendency	Groundwater chemical classification for the purposes of the Water Framework Directive and the Groundwater Directive, published by the UK Technical Advisory Group on the Water Framework Directive
The number of bodies in poor chemical status	**Water environment hub**
The characteristics of water bodies in poor chemical status	**Water environment hub** See also Table A8.3.14 above

Table A8.3.27: Background information on our method for assessing trends in the concentration of pollutants in groundwater

Background information topic	Where information can be accessed
How trend assessment from individual monitoring points is used in identifying significant and sustained upward trends in the concentration of any pollutant or reversal of that trend	Page 4, Section 4 of Groundwater trend assessment, published by the UK Technical Advisory Group on the Water Framework Directive
The reasons for the starting points defined for trend reversal	Page 6, Section 6 of Groundwater trend assessment, published by the UK Technical Advisory Group on the Water Framework Directive

Table A8.3.28: Information on performance criteria for methods of analysis used in chemical analysis

Substance	Substance Type[a]	PS/PHS Number[b]	Environmental quality standard[c]	Media - FW, MW, FW/MW or Biota[d]	Minimum Detection Limit[e]	Limit of Quantification[f]	Unit	Precision (RSD)%	Bias (%)
Alachlor[g]	PS	1	0.3	FW/MW			µg/l		
Anthracene	PHS	2	0.1	FW/MW	0.0017	0.0051*	µg/l	5.73	3.93
Atrazine	PS	3	0.6	FW/MW	0.0028	0.0084	µg/l	14.36	30.31
Benzene	PS	4	10	FW/MW	0.06	0.18	µg/l	6.41	2.28
Brominated diphenylethers	PHS	5	sum 0.0085	biota			ug/kg		
• PBDE 28	PHS	5		biota	0.4	1.6*	ug/kg	26.47	5.48
• PBDE 47	PHS	5		biota	0.6	2.4*	ug/kg	29.17	4.46
• PBDE 99	PHS	5		biota	0.5	2*	ug/kg	30.13	7.47
• PBDE 100	PHS	5		biota	0.4	1.6*	ug/kg	35.43	15.12
• PBDE 153	PHS	5		biota	0.5	2*	ug/kg	37.36	12.59
• PBDE 154	PHS	5		biota	0.5	2*	ug/kg	30.23	15.86
Cadmium	PHS	6	≤ 0.08	FW	0.012	0.05	µg/l	2.87	0.03
Cadmium	PHS	6	0.2 (dissolved)	MW	0.005	0.015*	µg/l	2.87	0.03
Carbon tetrachloride	OP	6a	12	FW/MW	0.1	0.3	µg/l	6.09	1.85
Chloroalkanes, C10-C13[g]	PHS	7	0.4	FW/MW			µg/l		
Chlorfenvinphos	PS	8	0.1	FW/MW	0.0048	0.0144	µg/l	14.28	6.51
Chlorpyrifos	PS	9	0.03	FW/MW	0.0021	0.0063	µg/l	17.61	15.02
Cyclodiene pesticides (aldrin, dieldrin, endrin, isodrin)	OP	9a	sum 0.01	FW			µg/l		
• aldrin[g]	OP	9a		FW			µg/l		
• dieldrin	OP	9a		FW	0.000004	0.000012 *	µg/l	16.19	27.93
• endrin[g]	OP	9a		FW			µg/l		
• isodrin[g]	OP	9a		FW			µg/l		
Cyclodiene pesticides (aldrin, dieldrin, endrin, isodrin)	OP	9a	sum 0.005	MW			µg/l		
• aldrin[g]	OP	9a		MW			µg/l		
• Dieldrin	OP	9a		MW	0.000004	0.000012 *	µg/l	16.19	27.93
• endrin[g]	OP	9a		MW			µg/l		
• isodrin[g]	OP	9a		MW			µg/l		
DDT (pp_DDT)[g]	OP	9b	0.01	FW/MW			µg/l		
DDT (Total)[g]	OP	9b	0.025	FW/MW			µg/l		
1,2-Dichloroethane	PS	10	10	FW/MW	0.21	0.51	µg/l	10.62	7.52
Dichloromethane	PS	11	20	FW/MW	0.38	1.14	µg/l	7.54	2.26
Di(2-ethylhexyl)-phthalate (DEHP)	PHS	12	1.3	FW/MW	0.1587	0.39*	µg/l	8.6	-0.41
Diuron	PS	13	0.2	FW/MW	0.0081	0.024	µg/l	11.5	1.55

Substance	Substance Type[a]	PS/PHS Number[b]	Environmental quality standard[c]	Media - FW, MW, FW/MW or Biota[d]	Minimum Detection Limit[e]	Limit of Quantification[f]	Unit	Precision (RSD)%	Bias (%)
Endosulfan[g]	PHS	14	0.005	FW			µg/l		
Endosulfan[g]	PHS	14	0.0005	MW			µg/l		
Fluoranthene	PS	15	0.0063	FW/MW	0.0026	0.0078*	µg/l	5.18	-5.66
Fluoranthene	PS	15	30	biota	0.58	3.6*	ug/kg	7.45	5.14
Hexachlorobenzene	PHS	16	0.05 (MAC)	FW/MW	0.0014	0.00342	µg/l	16.65	-3.37
Hexachlorobenzene	PHS	16	10	biota	1.7	6.8*	ug/kg	15.58	37.51
Hexachlorobutadiene	PHS	17	0.6 (MAC)	FW/MW	0.00108	0.00324	µg/l	19.18	-30.49
Hexachlorobutadiene	PHS	17	55	biota	3.3	13.2*	ug/kg	25.98	63.17
Hexachlorocyclohexane (Lindane)	PHS	18	0.02	FW	0.000007	0.000021 *	µg/l	13.37	10.21
Hexachlorocyclohexane (Lindane)	PHS	18	0.002	MW	0.000007	0.000021 *	µg/l	13.37	10.21
Isoproturon	PS	19	0.3	FW/MW	0.0081	0.024	µg/l	11.73	2.37
Lead	PS	20	1.2 bioavailable	FW	0.33	0.99	µg/l	3.09	0.01
Lead	PS	20	1.3 (dissolved)	MW	0.013	0.039*	µg/l	3.09	0.01
Mercury	PHS	21	0.07 (MAC)	FW/MW	0.0095	0.0285*	µg/l	3.51	-0.005
Mercury	PHS	21	20	biota	0.94	3.76*	ug/kg	3.1	-9.9
Naphthalene	PS	22	2	FW/MW	0.0183	0.055*	µg/l	11.7	-15.16
Nickel and its compounds	PS	23	4 bioavailable	FW	0.17	0.51	µg/l	2.76	0.01
Nickel and its compounds	PS	23	8.6 (dissolved)	MW	0.038	0.114*	µg/l	2.76	0.01
Nonylphenol (4-Nonylphenol)	PHS	24	0.3	FW/MW	0.0257	0.0771*	µg/l	11.69	-8.26
Octylphenol ((4-(1,1',3,3'-tetramethylbutyl)-phenol))	PS	25	0.1	FW	0.0029	0.0087	µg/l	11.5	-17.56
Octylphenol ((4-(1,1',3,3'-tetramethylbutyl)-phenol))	PS	25	0.01	MW	0.0029	0.0087	µg/l	11.5	-17.56
pentachlorobenzene	PHS	26	0.007	FW	0.00139	0.00417	µg/l	12.91	-7.78
pentachlorobenzene	PHS	26	0.0007	MW	0.00139	0.00417	µg/l	12.91	-7.78
Pentachlorophenol	PS	27	0.4	FW/MW	0.00259	0.0148	µg/l	8.87	-1.59
PAH - Benzo(a)pyrene	PHS	28	1.70E-04	FW/MW	0.0013	0.00005*	µg/l	13.43	-4.15
PAH - Benzo(a)pyrene	PHS	28	5	biota	0.66	2.64*	ug/kg	11.54	2.85
PAH - Benzo(b)fluoranthene	PHS	28	0.017 (MAC)	FW/MW	0.0011	0.0033*	µg/l	11.77	-4.99
PAH - Benzo(k)fluoranthene	PHS	28	0.017 (MAC)	FW/MW	0.0014	0.0042*	µg/l	6.98	-2.43
PAH - Benzo(g,h,i)perylene	PHS	28	0.0082 (MAC)	FW	0.0023	0.0069*	µg/l	12	-9.03
PAH - Benzo(g,h,i)perylene	PHS	28	0.00082 (MAC)	MW	0.0023	0.0069*	µg/l	12	-9.03

Substance	Substance Type[a]	PS/PHS Number[b]	Environmental quality standard[c]	Media - FW, MW, FW/MW or Biota[d]	Minimum Detection Limit[e]	Limit of Quantification[f]	Unit	Precision (RSD)%	Bias (%)
PAH - Indeno(1,2,3-cd)pyrene	PHS	28	n/a	FW	0.0052	0.0156	µg/l	13.11	6.59
Simazine	PS	29	1	FW/MW	0.0021	0.0063	µg/l	18.68	35.44
Tetrachloroethene	PS	29 a	0.4	FW/MW	0.07	0.21	µg/l	5.01	0
Trichloroethylene	PS	29 b	10	FW/MW	0.11	0.33	µg/l	4.16	1.73
Tributyltin compounds[g]	PHS	30	0.0002	FW/MW			µg/l		
1,3,5-Trichlorobenzene	PS	31	0.4	FW/MW	0.0015	0.0045	µg/l	19.6	-23.83
1,2,4-Trichlorobenzene	PS	31	0.4	FW/MW	0.00174	0.00522	µg/l	19.79	-18.46
1,2,3-Trichlorobenzene	PS	31	0.4	FW/MW	0.00204	0.00612	µg/l	19.66	-15.81
Trichloromethane	PS	32	2.5	FW/MW	0.14	0.42	µg/l	5.93	5.11
Trifluralin	PHS	33	0.03	FW/MW	0.0038	0.0114	µg/l	15.95	39.88
Dicofol[g]	PS	34	0.0013	FW			µg/l		
Dicofol[g]	PS	34	0.000032	MW			µg/l		
PFOS[g]	PHS	35	7E-04	FW			µg/l		
PFOS[g]	PHS	35	1E-04	MW			µg/l		
PFOS[g]	PHS	35	9.1	biota			ug/kg		
Quinoxyfen[g]	PS	36	0.15	FW			µg/l		
Quinoxyfen[g]	PS	36	0.015	MW			µg/l		
Dioxins[g]	PHS	37	Sum of PCDD+PCDF+ PCB-DL 0.0065	biota			µg.kg^{-1} TEQ		
Aclonifen[g]	PS	38	0.12	FW			µg/l		
Aclonifen[g]	PS	38	0.012	MW			µg/l		
Bifenox[g]	PHS	39	0.012	FW/MW			µg/l		
Cybutryne	PHS	40	0.0025	FW	0.0051	0.0153	µg/l	16.25	33.99
Cybutryne	PHS	40	0.0025	MW	0.0051	0.0153	µg/l	16.25	33.99
Cypermethrin	PS	41	8E-05	FW	0.0003	0.0009*	µg/l	7.99	7.21
Cypermethrin	PS	41	8E-06	MW	0.0003	0.0009*	µg/l	7.99	7.21
Dichlorvos[g]	PS	42	6E-04	FW			µg/l		
Dichlorvos[g]	PS	42	6E-05	MW			µg/l		
HBCDD[g]	PHS	43	0.0016	FW			µg/l		
HBCDD[g]	PHS	43	0.0008	MW			µg/l		
HBCDD[g]	PHS	43	167	biota			ug/kg		
Heptachlor[g]	PHS	44	2E-07	FW			µg/l		
Heptachlor[g]	PHS	44	1E-08	MW			µg/l		
Heptachlor[g]	PHS	44	0.034	biota			ug/kg		
Terbutryn	PS	45	0.065	FW/MW	0.0043	0.0129	µg/l	16.25	33.99
Cypermethrin	SP		0.1	FW/MW	0.0003	0.0009*	µg/l	7.99	7.21
2,4-D (2,4-dichlorophenoxyacetic acid)	SP		0.3	FW/MW	0.002	0.006	µg/l	10.12	2.52
2,4-dichlorophenol	SP		4.2	FW	0.00829	0.048	µg/l	7.13	4.09
2,4-dichlorophenol	SP		0.42	MW	0.00829	0.048	µg/l	7.13	4.09
3,4-dichloroaniline[g]	SP		0.2	FW/MW			µg/l		
Ammonia	SP		0.2	FW	0.024	0.09*	mg/l	1.41	4.67

Substance	Substance Type[a]	PS/PHS Number[b]	Environmental quality standard[c]	Media - FW, MW, FW/MW or Biota[d]	Minimum Detection Limit[e]	Limit of Quantification[f]	Unit	Precision (RSD)%	Bias (%)
							NH4 as N		
Ammonia	SP		21 (1.164)	MW	3.52 (0.195)	10.83 - 14.45* (0.6 - 0.8*)	ug/l (umol /l) NH4 as N	8.5	-15.35
Ammonia	SP		0.2	FW-loch	0.024	0.09*	mg/l NH4 as N	1.41	4.67
Arsenic	SP		50	FW	0.26	1	µg/l	2.94	0.01
Arsenic	SP		25	MW	0.26	1	µg/l	2.94	0.01
Benzylbutylphthalate (BBP)	SP		7.5	FW	0.0245	0.0735*	µg/l	5.68	-0.47
Benzylbutylphthalate (BBP)	SP		0.75	MW	0.0245	0.0735*	µg/l	5.68	-0.47
Chlorothalonil	SP		0.035	FW	0.0045	0.0135	µg/l	15.7	37.6
Carbendazim[g]	SP		0.15	FW			µg/l		
Chromium III[h]	SP		4.7	FW			µg/l		
Chromium VI[h]	SP		3.4	FW			µg/l		
Chromium VI[h]	SP		0.6	MW			µg/l		
Chromium Dissolved & total				FW/MW	0.21	0.45	µg/l	3.46	0.02
Copper	SP		1	FW	0.34	0.36	µg/l	2.58	0.01
copper	SP		3.76	MW	0.34	0.36	µg/l	2.58	0.01
Cyanide[g]	SP		1	FW/MW			µg/l		
Chlorine (Total available)	SP		2	FW	1	3*	mg/l as Cl	1.83	1.72
Chlorine (total residual)	SP		10	MW	1	3*	mg/l as Cl	1.83	1.72
Diazinon	SP		0.01	FW/MW	0.0007	0.0021	µg/l	10.65	0.1
Dimethoate	SP		0.48	FW/MW	0.0085	0.0255*	µg/l	28.01	-11.52
Glyphosate[g]	SP		196	FW/MW			µg/l		
Iron	SP		1000	FW/MW	0.01	0.03*	mg/l	3.09	0.01
Linuron	SP		0.5	FW/MW	0.0096	0.15	µg/l	11.96	1.41
Manganese	SP		123	FW	0.002	36.9*	µg/l	3.03	0.05
Mecoprop	SP		18	FW/MW	0.004	0.012	µg/l	9.5	2.25
Methiocarb	SP		0.01	FW	0.0029	0.0081	µg/l	17.61	15.02
Pendimethalin	SP		0.1	FW	0.0035	0.0105	µg/l	17.08	23.4
Permethrin	SP		0.001	FW			µg/l		
cis-permethrin				FW	0.0005	0.0015*	µg/l	14.04	11.87
trans-permethrin				FW	0.0005	0.0015*	µg/l	12.74	9.8
Permethrin	SP		0.0002	MW			µg/l		
cis-permethrin				MW	0.0005	0.0015*	µg/l	14.04	11.87
trans-permethrin				MW	0.0005	0.0015*	µg/l	12.74	9.8
Phenol	SP		7.7	FW	6	30*	µg/l	2.6	3
Tetrachloroethane[g]	SP		140	FW			µg/l		
Toluene	SP		74	FW/MW	0.09	0.27	µg/l	5.36	4.13
Triclosan[g]	SP		0.1	FW/MW			µg/l		

Substance	Substance Type[a]	PS/PHS Number[b]	Environmental quality standard[c]	Media - FW, MW, FW/MW or Biota[d]	Minimum Detection Limit[e]	Limit of Quantification[f]	Unit	Precision (RSD)%	Bias (%)
Zinc	SP		10.9	FW	1.87	0.87	µg/l	2.83	0.04
Zinc	SP		7.9	MW	1.87	0.87	µg/l	2.83	0.04
Phosphorus	other		12.7	FW	1.092	6*	µg/l	1.6	0.07
Phosphorus	other		5	FW-Loch	1.092	6*	µg/l	1.6	0.07
cobalt	other		n/a	FW	0.11	0.33	µg/l	2.87	-0.003
vanadium	other		n/a	FW	0.1	0.3	µg/l	3.38	0.02
Alkalinity	other		n/a	FW	0.47	1.5*	mg/l as CaCO 3	0.13	-0.05
Alkalinity	other		n/a	FW	1.75	9*	mg/l as CaCO 3	2.2	-0.56
Calcium	other		n/a	FW	0.005	0.015*	mg/l	3.23	0.03
Dissolved organic carbon	other		n/a	FW	0.286	2*	mg/l	4.5	4.4
Magnesium	other		n/a	FW	0.005	0.015*	mg/l	3.09	0.05

Note to table A8.3.28:

Performance results cited in this table refer to results of validation exercises based on current best available techniques. Capabilities will change over time as available techniques / instrumentation improve.

[a] Substance types: 'PS' means priority substance; 'PHS' means priority hazardous substance; 'OP' means other pollutants, as listed in Annex I of 2008/105/EC as amended by 2013/39/EU; and 'SP' means specific pollutant.

[b] Number allocated to PS and PHS in Annex I of 2008/105/EC as amended by 2013/39/EU.

[c] For substances with no annual average water performance against the water column maximum allowable concentration (MAC) is included.

[d] Media to which the environmental standard applies: freshwater (FW), estuary and coastal water (MW), both (FW/MW) or biota. Separate entries are included for cases where analytical performance differs between media.

[e] 'Minimum detection limit' refers to the whole analytical process, and encompasses instrumentation limits of detection.

[f] Method development is in process for limits of quantification highlighted with an asterix. For cases where the limit is >1/3 of the environmental standard, further method development is under consideration within the constraints of best available techniques not entailing excessive costs.

g method to be developed.

[h] Dissolved chromium data are used for classifying against Cr(III) and Cr(VI).

Appendix 8.4: Programme of measures

This appendix summarises the programme of measures that will be used to achieve our goals for the protection and improvement of the district's water environment. It includes information about roles and responsibilities with respect to the programme, co-ordination arrangements for different parts of the programme and examples of the wide range of different measures in the programme.

Table A8.4.1: Competent authorities – general role with respect to measures

Authority	**Relevant functions** [*The Water Environment (Relevant Enactments and Designation of Responsible Authorities and Functions (Scotland) Order 2011*]	**Duties** [under *Water Environment and Water Services (Scotland) Act 2003*]
Scottish Ministers	Coast Protection Act 1949; Roads (Scotland) Act 1984; Natural Heritage (Scotland) Act 1991; The Protection of Water Against Agricultural Nitrate Pollution (Scotland) Regulations 1996; Town and Country Planning (Scotland) Act 1997; Water Industry (Scotland) Act 2002; The Environmental Impact Assessment (Agriculture) (Scotland) Regulations 2006; Transport and Works (Scotland) Act 2007; Aquaculture and Fisheries (Scotland) Act 2007; The Bathing Waters (Scotland) Regulations 2008; The Aquatic Animal Health (Scotland) Regulations 2009; The Flood Risk Management (Scotland) Act 2009; The Marine (Scotland) Act 2010; The Water Environment (Controlled Activities) (Scotland) Regulations 2011	• secure compliance with the requirements of the Water Framework Directive when exercising relevant functions; • so far as practicable, adopt an integrated approach by cooperating with each other and responsible authorities with a view to coordinating the exercise of their respective functions.
Scottish Environment Protection Agency (SEPA)	The Water Environment (Controlled Activities) (Scotland) Regulations 2011; The Bathing Waters (Scotland) Regulations 2008; The Flood Risk Management (Scotland) Act 2009	

Table A8.4.2: Coordinated approach - responsible authorities

Authority	**Relevant functions** [*The Water Environment (Relevant Enactments and Designation of Responsible Authorities and Functions (Scotland) Order 2011*]	**Duties** [under *Water Environment and Water Services (Scotland) Act 2003*]
Local authorities	The Coast Protection Act 1949	• secure compliance with the requirements of the Water Framework Directive when exercising relevant functions; • so far as practicable, adopt an integrated approach by cooperating with each other, the SEPA and Scottish Ministers with a view to coordinating the exercise of their respective functions; • have regard to the river basin management plan.
	The Civic Government (Scotland) Act 1982	
	The Roads (Scotland) Act 1984	
	The Environmental Protection Act 1990	
	The Town and Country Planning (Scotland) Act 1997	
	The Flood Risk Management (Scotland) Act 2009	
	The Bathing Waters (Scotland) Regulations 2008	
Scottish Water	The Sewerage (Scotland) Act 1968	
	The Water (Scotland) Act 1980	
	The Water Industry (Scotland) Act 2002	
	The Urban Waste Water Treatment (Scotland) Regulations 1994	
Scottish Natural Heritage	The Natural Heritage (Scotland) Act 1991	
	The Nature Conservation (Scotland) Act 2004	
	The Conservation (Natural Habitats, & c) Regulations 2004	
National park authorities	The National Parks (Scotland) Act 2000	
British Waterways (Scottish Canals)	The Transport Act 1962	
	The British Waterways Act 1995	
Forestry Commission Scotland	The Forestry Act 1967	

Table A8.4.3: Coordinated approach – all public bodies and office-holders

Duty to have regard to the river basin management plan [Under *Water Environment and Water Services (Scotland) Act 2003*]

Table A8.4.4: Coordination - Supplementary plans and planning frameworks

Topic	Plan or planning framework	Primary responsibility
Physical condition	Improving the physical condition of Scotland's water environment	Scottish Government; SEPA
Rural diffuse pollution	Rural diffuse pollution plan for Scotland	Diffuse Pollution Management Advisory Group
Invasive non-native species	The Great Britain Invasive Non-native Species Strategy	Department for Environment, Food & Rural Affairs; Scottish Government; Welsh Government
	Managing invasive non-native species in Scotland's water environment: A supplementary plan to the river basin management plans	SEPA; Scottish Government; Forestry Commission Scotland; Scottish Natural Heritage
	Biosecurity Plans	Local Fishery Trusts and Boards
	Marine invasive non-native species in the Solway	Solway Firth Partnership
Freshwater flows and levels	Water Scarcity Plan	SEPA
Urban waste water and urban drainage-related pressures	Planning advice note (PAN) 79: water and drainage	Scottish Government
Forestry-related pressures	Land management plans	Forestry Commission Scotland
Aquaculture-related pressures (including on wild fish)	A Fresh Start: The renewed strategic framework for Scottish aquaculture	Scottish Government
	Scottish Planning Policy: SPP 22: Planning for Fish Farming	Scottish Government
	Locational guidelines: Marine Fish Farms in Scottish Waters	Scottish Government
Eel management	Eel Management Plan for Solway Tweed	Department of Environment Food and Rural Affairs

Measures

Table A8.4.5: Measures to protect and improve water quality - point source discharges

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Controls on point source discharges liable to cause pollution	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
		Marine (Scotland) Act 2010	Scottish Ministers (Marine Scotland)
		The Merchant Shipping (Prevention of Pollution)(Limits) Regulations 2014 The Merchant Shipping (Prevention of Pollution by Sewage and Garbage from Ships) Regulations 2008 The Merchant Shipping (Pollution) Act 2006 The Merchant Shipping Act 1995	Maritime and Coastguard Authority
		Food and Environment Protection Act 1995	Scottish Ministers (Marine Scotland)
Basic	Prohibition of direct discharges of pollutants into groundwater	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
Basic	Measures to secure compliance with the Integrated Pollution Prevention and Control Directive	The Pollution Prevention and Control (Scotland) Regulations 2012	SEPA
Basic	Measures to secure compliance with the Urban Waste Water Treatment Directive	Urban Waste Water Treatment (Scotland) Regulations 1994	Scottish Ministers, SEPA
		Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
Basic	Measures to secure compliance with the Priority Substances Directive	Delivered through implementation of other basic measures for point sources	As above
Supplementary	Economic instrument	Quality and Standards Programme (publically-funded programme of investment by Scottish Water)	Scottish Ministers; Scottish Water
Supplementary	Education project	Planning Advice Note (PAN) 50: controlling the environmental effects of surface mineral workings	Local authorities
Supplementary	Codes of good practice	Good practice for decommissioning redundant boreholes and wells	SEPA

Table A8.4.6: Measures to protect and improve water quality - rural diffuse sources

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Controls on diffuse sources liable to cause pollution	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
		The Plant Protection Products (Sustainable Use) Regulations 2012	Scottish Ministers
Basic	Measures to secure the best environmental practices required under the Nitrates Directive to control nitrate pollution from agricultural sources	The Protection of Water Against Agricultural Nitrate Pollution (Scotland) Regulations 1996 The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008	Scottish Ministers
Basic	Measures required by the Plant Protection Products Directive	The Plant Protection Products Regulations 2011	Scottish Ministers
Basic:	Measures required by the Sewage Sludge Directive	The Sludge (Use in Agriculture) Regulations 1989	SEPA
Basic	Measures to secure compliance with the Priority Substances Directive	Delivered through implementation of other basic measures for diffuse sources	As above
Supplementary	Educational project	Priority catchment diffuse pollution management awareness campaign	SEPA
		Farming and Water Scotland	Scottish Ministers; Scotland's Rural College; SEPA; DPMAG; National Farmers Union Scotland
		Constructed Farm Wetlands: design Manual for Scotland and Northern Ireland	SEPA
		The Voluntary Initiative: Promoting Responsible Pesticide Use	Wide range of government administrations, government agencies, farming unions, voluntary environmental organisations and businesses with agricultural interests
		NetRegs: Advice on septic tanks	SEPA
	Legislative instrument	The Forestry Act 1967 (control of tree felling)	Forestry Commission Scotland

Table A8.4.6: Measures to protect and improve water quality - rural diffuse sources continued

Measure type	Measure	How it is delivered	Primary responsibility
	Economic instruments	Scottish Rural Development Programme	Scottish Ministers
		The Common Agricultural Policy (Cross-Compliance) (Scotland) Regulations 2014 (Good Agricultural and Environmental Conditions)	Scottish Ministers
		Scottish Water Sustainable Land Management Incentive Scheme	Scottish Water
	Codes of good practice	UK Forestry Standard Forest & Water Guidelines	Forestry Commission
		Prevention of Environmental Pollution from Agricultural Activity: A code of good practice	Scottish Ministers
		Code of Practice for Using Plant Protection Products in Scotland	Scottish Ministers
		The 4 Point Plan	Scottish Ministers
		Code of Practice: A Guide for Users of Sewage Treatment Systems	British Water
		Sheep dipping code of practice for Scottish farmers, crofters and contractors	SEPA

Table A8.4.7: Measures to protect and improve water quality - urban diffuse sources

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Controls on diffuse sources liable to cause pollution	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
Basic	Measures to secure compliance with the Priority Substances Directive	Delivered through implementation of other basic measures for diffuse sources	As above
Supplementary	Educational project	Sustainable urban drainage system – national design manual The SUDS Manual	Construction Industry Research and Information Association
		Sustainable urban drainage system – good practice design SUDS for roads	SUDS Working Party; Society of Chief Officers of Transportation in Scotland
		Surface water action plans	Scottish Water
		Planning advice note (PAN) 61: Planning and sustainable urban drainage systems	Local authorities
	Legislative instruments	Dog Fouling (Scotland) Act 2003	Local authorities

Table A8.4.8: Measures to protect and improve water quality - diffuse acid deposition

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Controls on diffuse sources liable to cause pollution	The Pollution Prevention and Control (Scotland) Regulations 2012	SEPA
Supplementary	Various	For information on other measures see: Emissions of air pollutants in the UK, 1970 to 2013	
Supplementary	Codes of good practice	UK Forestry Standard Forest & Water Guidelines (good practices forest management in catchments at risk from acid rain)	Forestry Commission Scotland
Supplementary	Legislative	The Forestry Act 1967 (control of tree felling)	Forestry Commission Scotland
Supplementary	Economic	Forestry Grant Scheme	Scottish Government; Forestry Commission Scotland

Table A8.4.9: Measures to protect and improve water quality - legacy sources

Measure type	Measure	How it is delivered	Primary responsibility
Contaminated ground			
Basic	Measures to control discharges of pollutants to groundwater or surface waters from contaminated ground	Environmental Protection Act 1990; Contaminated Land (Scotland) Regulations 2000	Local authorities; SEPA
		The Radioactive Contaminated Land (Scotland) Regulations 2007	SEPA
		Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
Supplementary	Legislative instrument	Town & Country Planning (Scotland) Act 1997 (conditions on site development)	Local authorities
Supplementary	Education project	Planning Advice Note (PAN) 33: Development of contaminated land	Scottish Government
Mine water			
Supplementary	Other: Management agreements	Mining legacy management	Coal Authority

Table A8.4.10: Measures to protect and improve water quality - general pollution prevention measures

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Measures required under the Major Accidents Directive	Control of Major Accident Hazards Regulations 2015	SEPA; Health and Safety Executive
Basic	Measures to prevent significant losses of pollutants from technical installations, and to prevent and/or to reduce the impact of accidental pollution incidents	Control of Major Accident Hazards Regulations 2015	SEPA; Health and Safety Executive
		The Pollution Prevention and Control (Scotland) Regulations 2012	SEPA
		The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003	SEPA
		The Water Environment (Oil Storage) (Scotland) Regulations 2006	SEPA
		The Flood Risk Management (Scotland) Act 2009 (Flood warning system)	SEPA
		The Environmental Liability (Scotland) Regulations 2009	SEPA

Table A8.4.10: Measures to protect and improve water quality - general pollution prevention measures continued

Measure type	Measure	How it is delivered	Primary responsibility
Supplementary	Legislative instrument	The Building (Scotland) Regulations 2004 (design, construction and drainage requirements for buildings)	Local authorities
Supplementary	Other: Emergency response plans	National Contingency Plan for responses to marine pollution	Scottish Ministers; Maritime and Coastguard Agency
Supplementary	Educational projects	Oil care campaign	Partnership of government agencies, professional bodies, businesses and trade associations
		Pollution prevention guidelines	SEPA
		Silt control guidance: preventing pollution while dredging	SEPA
Supplementary	Codes of good practice	Underground storage tanks for liquid hydrocarbons: Code of Practice for Installers, Owners and Operators of Underground Storage Tanks (& Pipelines)	SEPA

Table A8.4.11: Measures to protect and improve water quality – additional source control measures

Measure type	Measure	How it is delivered	Primary responsibility
Supplementary	Legislative instrument	The Detergent Regulations 2010 (limits on inorganic phosphate content of laundry detergents)	UK Government
		Sewerage (Scotland) Act 1968 (control of pollutants discharged into the public sewer)	Scottish Water
		The REACH Enforcement Regulations 2008	SEPA; Health and Safety Executive
		EU Biocides Regulation 2012; The Biocidal Products and Chemicals (Appointment of Authorities and Enforcement) Regulations 2013	Scottish Ministers

Table A8.4.12: Steps taken to avoid increased pollution of marine waters

The measures we are taking to protect and improve the condition of water bodies and protected areas in the district do not involve increasing pollution of marine waters.

Pollution of marine waters would only increase if, in order to achieve our objectives, pollutants were disposed of in those waters. The steps we have in place to prevent this are detailed below.

Means by which marine waters could be affected	Steps to prevent pollution of marine waters	Details
Disposal of pollutants in marine waters via long sea outfall pipes	The seaward limit of coastal water bodies is a minimum of three nautical miles (5,556 metres) from the shore. Along large parts of the district's coast, the limit is even further offshore.	• Water Environment and Water Services (Scotland) Act 2003 • Annex 1: Map of the river basin district
	No outfall pipes extend beyond the seaward limits of coastal waters All inputs of pollutants into coastal waters are controlled to achieve the objectives of the water bodies concerned.	• See controls listed in Table A8.6 above
	Our controls on pollution extend beyond the seaward limit of coastal waters to protect marine waters from pollution.	• Marine (Scotland) Act 2010 • Food and Environment Protection Act 1995
Transport of pollutants by vessel for disposal in marine waters	Our controls on pollution include pollution caused by dumping at sea and extend beyond the seaward limit of coastal waters to protect marine waters from pollution.	• Marine (Scotland) Act 2010 • Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter

Table A8.4.13: Measures to protect and improve water flows and levels

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Controls over the abstraction of fresh surface water and groundwater, and impoundment of fresh surface water	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
Basic	Controls on artificial recharge or augmentation of groundwater bodies	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
Supplementary	Economic instrument	Quality and Standards Programme (publically-funded programme of investment by Scottish Water)	Scottish Ministers and Scottish Water
		Scottish Rural Development Programme (funding support for storage ponds for irrigation)	Scottish Ministers
Supplementary	Educational project	Guidance for developers of run-of-river hydropower schemes (guide to suitable locations and expected mitigation)	SEPA

Table A8.4.14: Measures to avoid the creation of, and remove, barriers to fish migration

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Controls over the impoundment of fresh surface water	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
Supplementary	Legislative instrument	The Water Environment (Remedial Measures) (Scotland) Regulations 2015 (in prep.)	SEPA
Supplementary	Economic instrument	Publically-funded Water Environment Fund for improvements to the physical condition of water bodies	SEPA
Supplementary	Educational project	Guidance for developers of run-of-river hydropower schemes (guide to suitable locations and expected mitigation)	SEPA

Table A8.4.15: Measures to protect and improve physical condition

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Controls on morphological alterations	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
		Marine (Scotland) Act 2010	Scottish Ministers
Supplementary	Legislative instrument	The Water Environment (Remedial Measures) (Scotland) Regulations 2015 (in prep.)	SEPA
Supplementary	Economic instrument	Publically-funded Water Environment Fund for improvements to the physical condition of water bodies	SEPA
		Scottish Rural Development Programme	Scottish Ministers
		Forestry Grant Scheme	Scottish Ministers; Forestry Commission Scotland
Supplementary	Codes of good practice	UK Forestry Standard Forest & Water Guidelines (good practices in forest management)	Forestry Commission Scotland
Supplementary	Educational projects	Dredging – a land manager's guide to the rules	SEPA
		Engineering in the water environment good practice guide: Bank protection rivers and lochs	SEPA
		Engineering in the water environment good practice guide: River crossings	SEPA
		Engineering in the water environment good practice guide: Sediment management	SEPA
		Engineering in the water environment good practice guide: Intakes and outfalls	SEPA
		Engineering in the water environment good practice guide: Temporary construction methods	SEPA
		Engineering in the water environment good practice guide: Riparian vegetation management	SEPA
		Managing river habitats for fisheries	SEPA
Supplementary	Projects to demonstrate good practice and improvement in the physical water environment	Pilot catchment projects	SEPA and partners

Table A8.4.16: Measures to prevent and mitigate the impacts of invasive non-native species or the spread of disease

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Controls on invasive non-native species	Wildlife & Countryside Act 1981	SEPA; Scottish Natural Heritage; Forestry Commission Scotland; Scottish Ministers (Marine Scotland); Police Scotland.
		Aquaculture and Fisheries (Scotland) Act 2007	Scottish Ministers
		The Alien and Locally Absent Species in Aquaculture (Scotland) Regulations 2015	Scottish Ministers
Supplementary	Emergency response plans	Gyrodactylus salaris contingency plan	Scottish Ministers
Supplementary	Legislative instrument	Aquaculture and Fisheries (Scotland) act 2007 (including control of sea lice and prevention of fish escapes	Scottish Ministers
Supplementary	Technical standards	A technical standard for Scottish finfish aquaculture (standards to prevent escapes into the wild of farmed fish)	Scottish Ministers
Supplementary	Codes of good practice	Non-native Species Code of Practice	Scottish Ministers
		Code of Practice to Avoid the Introduction of *Gyrodactylus salaris* to GB	Scottish Ministers
Supplementary	Other relevant measures	Invasive species biosecurity programmes	Rivers and Fisheries Trusts Scotland
		Invasive species biosecurity programme	Firth of Clyde Forum
Supplementary	Education project	Information for the aquaculture industry	NAFC Marine Centre; University of the Highlands and Islands
		Information for marinas and marine users	NAFC Marine Centre; University of the Highlands and Islands

Table A8.4.17: Specific measures to help conserve wild fish stocks

Measure type	Measure	How it is delivered	Primary responsibility
Supplementary	Legislative instrument	The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003	Police Scotland; Water Bailiffs
		The Conservation of Salmon (River Annan Salmon Fishery District) (Scotland) Regulations 2012	
		The Conservation of Salmon (Annual Close Times and Catch and Release) (Scotland) Regulations 2014	
		The Freshwater Fish Conservation (Prohibition of Fishing for Eels) (Scotland) Regulations 2008	

Table A8.4.18: Specific measures for assessing the environmental risk posed by certain development projects

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Measures to transpose the requirements of the Environmental Impact Assessment Directive	The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011	Local authorities
		The Environmental Impact Assessment (Agriculture) (Scotland) Regulations 2006	Scottish Ministers
		The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000	Scottish Ministers
		The Roads (Scotland) Act 1984	Scottish Ministers
		Water Environment (Controlled Activities) (Scotland) Regulations 2011 (in relation to irrigation projects for agriculture)	SEPA
		The Environmental Impact Assessment (Forestry) (Scotland) Regulations 1999	Forestry Commission Scotland

Table A8.4.19: Measures for protected areas for the conservation of internationally important species and habitats

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Measures to contribute to the achievement of the objectives of the Habitats Directive	Part 2 of the Nature Conservation (Scotland) Act 2004; The Conservation (Natural Habitats &c) Regulations 1994; Wildlife and Countryside Act 1981	Scottish Natural Heritage; Scottish Ministers; SEPA; Police Scotland
Basic	Measures to contribute to the achievement of the objectives of the Birds Directive	Part 2 of the Nature Conservation (Scotland) Act 2004; The Conservation (Natural Habitats &c) Regulations 1994; Wildlife and Countryside Act 1981	Scottish Natural Heritage; Scottish Ministers; SEPA; Police Scotland
Supplementary	Education project	Farming, SSSIs and Natura sites	National Farmers' Union Scotland; Scottish Natural Heritage

A8.4.20: Measures for bathing water protected areas

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Measures to secure the achievement of the objectives for Bathing Water Protected Areas	Bathing Waters (Scotland) Regulations 2008; The Bathing Waters (Sampling and Analysis) (Scotland) Regulations 2008	Scottish Ministers; SEPA
		Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA

Table A8.4.21: Measures for drinking water protected areas

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Measures to protect drinking water sources	The Water Environment (Drinking Water Protected Areas (Scotland) Order 2013	Scottish Ministers
		Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA

Table A8.4.22: General measures to facilitate the protection and improvement of the water environment

Measure type	Measure	How it is delivered	Primary responsibility
Basic	Measures to recover the cost of water services	Water supply and sewerage charges	Water Industry Commission for Scotland Scottish Water
Basic	Water pricing policies	Price setting for the water industry	Water Industry Commission for Scotland
Basic	Measures to promote an efficient and sustainable water use	Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA
Supplementary	Education project – efficient and sustainable water use	Water efficiency advice and efficiency plan	Scottish Water
Supplementary		NetRegs: water use efficiency guide	SEPA

Climate check of the measures for addressing the most widespread pressures

We have undertaken climate checks of the types of action that may be used to address the most widespread pressures on the water environment. The results of the checks are presented in the summaries below. The assessments give a general indication of any likely significant implications of different on-the-ground actions in terms of:

A. greenhouse gas emissions;
B. preparing Scotland for a future climate (e.g. whether the action will help us better cope economically, environmentally or socially with hotter, drier summers, etc.);
C. the action's continued effectiveness under Scotland's predicted future climate.

The considerations on which the checks were based are further described in Table A8.4.1 together with keys for interpreting the results.

We will use the outcome of the check to advise those taking action on whether a solution is likely to:

- contribute to meeting the challenges of climate change;
- need to be designed with Scotland's future climate in mind if its effectiveness is to be maintained;
- have one or more negative effects in terms of greenhouse gas emissions or preparing Scotland for a future climate. Where such actions are necessary to achieve our objectives, we will work to ensure that their negative effects are minimised as far as possible and balanced by the overall benefits of improving the water environment.

Table A8.4.23: Considerations on which the climate check is based

A. Greenhouse gas emissions	B. Preparing Scotland for a future climate	C. Action's continued effectiveness under a changed climate
• Will the solutions lead to an increase or decrease in greenhouse gas emissions? • Will the action help capture carbon in the soil or in vegetation? • Will the action reduce energy use in the long-term?	**Flood risk** • Will the action increase or decrease flood risks under wetter winters, more intense rainfall and higher sea levels? **Drought** • Will the action help us maintain water uses in periods of drought caused by hotter, drier summers? **Ecosystem services** • Will the action make wildlife more or less resilient to a changed climate? • Will the action help sustain economically important water uses in a changed climate (eg fisheries, tourism, agriculture, etc)? • Will the action enable the water environment to continue to recycle our wastes under a changed climate?	• Will the action remain effective under: – wetter winters and more intense rainfall? – drier summers? – higher sea levels? • If not, can it be easily adapted in the future so that it is effective?

Key to A			Key to B			Key to C		
Net emissions reduced	Net emissions increased	No likely significant change either way	Expected to make us better prepared	May make us less able to cope	No likely significant effect	Resilient and unlikely to need adapting or very flexible	Resilient but may need to be adapted or supplemented	Not resilient or easily adapted

Table A8.4.24: Measures to address rural diffuse pollution

Climate check of:	A: Greenhouse emissions	B: Preparing Scotland for a future climate					C: Action's continued effectiveness
		flood risk	drought	Ecosystem services			
				Biodiversity	Economic	Recycling wastes	
Action manage inputs to land	reduced emissions of nitrous oxide and from fertiliser manufacture	improved soil management - increased rainwater infiltration and retention	improved soil management - slowed rainwater run-off	-	-	-	Action expected to be resilient
Action intercept and store/treat	carbon sequestration in buffer zone soils and vegetation	buffer slows rate of run-off	water retention in wetlands and groundwater for slow release	expansion of habitats (ponds, wetlands) increase resilience	-	-	May need to design for future climate (e.g. higher sea levels; more intense rainfall)
Outcome improved water quality	reduced drinking water treatment	-	-	reduced stress - increased resilience of	reduced stress - helps sustain	reduced stress - helps system	

	needed downstream			sensitive species	fisheries, quality for tourism, etc.	maintain service	

Table A8.4.25: Measures to address waste water discharges

Climate check of:	**A: Greenhouse emissions**	**B: Preparing Scotland for a future climate**					**C: Action's continued effectiveness**
		flood risk	drought	Ecosystem services			
				Biodiversity	Economic	Recycling wastes	
Action reduce pollutant content of sewage at source	less waste and hence less loss of embedded energy; reduced end-of-pipe treatment	-	-	-	-	-	Action expected to be resilient
Action collect and treat: improve sewer network; increase treatment	energy costs of pumping and treatment - unless tertiary treatment in wetlands	Will benefit flood risk management if involves major upgrades to combined sewers	-	-	-	-	Action expected to be resilient
Action collect and treat: separate out rainwater run-off	reduced pumping; carbon sequestration	slowed rate of run-off	water retention for slow release	expansion of habitats (ponds, wetlands) increase resilience			May need to design for future climate (e.g. to sea level rise, more intense rainfall)
Outcome improved water quality	-	-	-	reduced stress - increased resilience of sensitive species	reduced stress - helps sustain fisheries, quality for tourism, etc.	reduced stress - helps system maintain service	

Table A8.4.26: Measures to improve physical condition - bank and shore vegetation

Climate check of:	**A: Greenhouse emissions**	**B: Preparing Scotland for a future climate**					**C: Action's continued effectiveness**
		flood risk	drought	Ecosystem services			
				Biodiversity	Economic	Recycling wastes	
Actions and outcome - improved bank and shore vegetation	increased carbon sequestration in vegetation and soils	banks and shores more resistant to erosion and slow flood waters down	-	better food supply + shading reduces thermal stress; expansion of bank and shore habitats; healthy vegetation likely to be more resistant to invasion by non-native species	reduced stress - helps sustain wild fisheries, quality for tourism, etc.	reduced stress - helps system maintain service	Actions expected to be resilient

Table A8.4.27: Measures to improve physical condition – addressing structural modifications

Climate check of:	A: Greenhouse emissions	B: Preparing Scotland for a future climate					C: Action's continued effectiveness
		flood risk	drought	Ecosystem services			
				Biodiversity	Economic	Recycling wastes	
Action reduce maintenance	less maintenance reduces energy usage	-	-	expansion of bank, shore and floodplain habitats increases resilience	-	-	Action expected to be resilient
Action low and high level interventions	Short-duration increased energy usage during intervention	-	-	expansion of bank, shore and floodplain habitats increases resilience	-	-	Action expected to be resilient[20]
Outcome improved bed, bank and shore physical characteristics	-	River flows slowed and re-connected with un-developed flood plains	-	reduced stress - (e.g. narrowing of over-wide channels) increases resilience of sensitive species	reduced stress - helps sustain wild fisheries, quality for tourism, etc	reduced stress - helps system maintain service	

Table A8.4.28: Measures to remove barriers to fish migration

Climate check of:	A: Greenhouse emissions	B: Preparing Scotland for a future climate					C: Action's continued effectiveness
		flood risk	drought	Ecosystem services			
				Biodiversity	Economic	Recycling wastes	
Action install fish passes	short-duration increase in energy usage during construction	-	Possible increased flow releases from water storage reservoirs to operate fish pass	-	-	-	Action expected to be resilient
Action remove non-operational dams, weirs and other structures	End of on-going maintenance requirements reduces energy usage	may reduce flood risk by preventing water backing up (e.g. at culverts)	-	-	-	-	Action expected to be resilient
Outcome improved access for migratory fish	-	-	-	expanded fish populations increases resilience	reduced stress - helps sustain wild fisheries, quality for tourism, etc.	-	

[20] Assumes that consideration is given to future rainfall patterns (e.g. more frequent intense storms) when designing action for engineering modifications serving a flood protection function.

Table A8.4.29: Measures to improve flows and levels - hydropower schemes

Climate check of:	A: Greenhouse emissions	B: Preparing Scotland for a future climate					C: Action's continued effectiveness
		flood risk	drought	Ecosystem services			
				Biodiversity	Economic	Recycling wastes	
Action Provide improved river flows by integrated operation of scheme; changing pattern of abstraction	unless new generator installed on dam and powered by additional releases	-	-	-	-	-	Action expected to be resilient
Action Provide improved river flows by reducing net abstraction	less water for generation	-		-	-	-	Action expected to be resilient
Outcome improved water flows and levels	-	-	more water in rivers and flows maintained for longer	reduced stress - increased resilience of sensitive species	reduced stress - helps sustain wild fisheries, quality for tourism, etc	reduced stress - helps system maintain service	

Table A8.4.30: Measures to improve flows and levels – drinking water supply

Preliminary climate check of planned action to reduce pressures from drinking water supply on water flows and levels

Climate check of:	A: Greenhouse emissions	B: Preparing Scotland for a future climate					C: Action's continued effectiveness
		flood risk	drought	Ecosystem services			
				Biodiversity	Economic	Recycling wastes	
Action reduce leakage rates in water supply network	less water unnecessarily treated and pumped	-	-	-	-	-	may need to be supplemented due to increased demand
Action increase water use efficiency	less water treated and pumped	-	-	-	-	-	may need to be supplemented due to increased demand
Action Increase supply capacity	uncertain - depends on whether pumping and purification treatment would increase or decrease	integrated system has flexibility to store flood waters	-	-	-	-	may need to design for changed rainfall pattern and increased demand
Outcome improved water flows and levels	-	-	more water in rivers - flows maintained for longer	reduced stress - increased resilience of sensitive species	reduced stress - helps sustain wild fisheries, quality for tourism, etc	reduced stress - helps system maintain service	

Table A8.4.31: Measures to improve flows and levels – agricultural land irrigation

Climate check of planned action to reduce pressures from irrigation abstractions							
Climate check of:	**A: Greenhouse emissions**	**B: Preparing Scotland for a future climate**					**C: Action's continued effectiveness**
		flood risk	drought	Ecosystem services			
				Biodiversity	Economic	Recycling wastes	
Action reduce demand	less water pumped due to more efficient use; improved carbon sequestration in soils due to good soil management	-	more water stored in soils for slow release	-	-	-	Action expected to be resilient and flexible as climate changes
Action change timing of abstraction	-	-	-	expansion of habitats (storage ponds) increases resilience	-	-	may need to design ponds for increased demand
Action provide supply from other sources	uncertain - depends on whether pumping increases or decreases	-	-	-	-	-	Action expected to be resilient and flexible as climate changes
Outcome improved water flows and levels	-	-	more water in rivers in dry weather	reduced stress - increased resilience of sensitive species	reduced stress - helps sustain wild fisheries, quality for tourism, etc	reduced stress - helps system maintain service	

Appendix 8.5: Cost recovery

This appendix outlines the practical steps and measures taken to apply the principle of recovery of the costs of water use in accordance with Article 9 of the Water Framework Directive.

Introduction

River basin management planning will deliver the long-term sustainability of our rivers, lochs, coasts and groundwater, with all water users and responsible bodies playing their part in the achievement of our aims and objectives stated elsewhere in this plan.

It is recognised that a wide variety of mechanisms and measures will be required to ensure this approach is successful. Water pricing policies can make a valuable contribution to the sustainable management of our water resources. These can act as an incentive to reduce pollution and improve the efficiency of water usage. They can also help to ensure that available resources are effectively allocated between water uses.

We have taken steps to introduce such policies, in accordance with the polluter pays principle, as one element of our integrated Water Framework Directive (WFD) implementation programme. These various components, taken as a whole, aim to achieve the Directive's requirements.

In developing the approach to cost recovery, the likely social, environmental and economic effects of such recovery have been taken into account, as well as the geographic and climatic conditions of the Solway Tweed river basin district.

Description of steps taken

Practical approaches to incorporating water pricing policies within our implementation framework have been introduced. There are two key mechanisms for the recovery of costs in respect of water use. These relate to:

- the provision of water services by our public water authority;
- our control regime for ensuring sustainable water use across the environment.

Provision of water services by our public water authority

Our water and sewerage services provider, Scottish Water, is a publicly owned body and a responsible authority under the Water Environment and Water Services (Scotland) Act 2003. As a responsible authority Scottish Water must exercise its water supply and sewerage functions to enable the achievement of our environmental objectives as required by the Water Framework Directive. Scottish Water operates within a regulatory framework established by the Scottish Parliament. In this framework Scottish Ministers, acting on behalf of the people of Scotland, set the objectives for the industry to be delivered at the lowest overall reasonable cost to customers. Key players in the regulatory framework are Scottish Water's economic regulator, the Water Industry Commission for Scotland, the customer representative bodies, Consumer Advice Scotland and the Scottish Public Services Ombudsman; the quality regulators, the Drinking Water Quality Regulator and SEPA.

The costs of providing water supply and sewerage services are fully recovered by Scottish Water through customer charges. This includes the recovery of charge revenue from households as well as non-household customers, including businesses and agriculture. To extend WFD principles to Scottish Water customers, the Water Services etc. (Scotland) Act 2005 set up an independent economic regulator, the Water Industry Commission for Scotland. It is this body that determines the financial resources required by Scottish Water to deliver all of its public policy objectives, including environmental objectives, and the charges that it can set. The principles according to which charges should be determined over every regulatory control period are set down by Scottish Ministers. Their statement for the current regulatory control period 2015-21 can be viewed at: http://www.gov.scot/Resource/0045/00459866.pdf

In this statement, Ministers confirm that there should be full cost recovery of water services (Principle 3) and that charges should be cost-reflective between customer groups (Principle 5). Cost recovery in the non-household sector has been implemented through:

- The metering of all non-household customers (including industry and agriculture operators) where practicable. This ensures an adequate contribution to water services is provided by industry and agriculture user and to improve implementation of the polluter pays principle.

In April 2008, retail competition was introduced for all non-household water customers which was a world first. The separation of the retail activities from wholesale has sharpened the incentives for water retailers to find solutions for their customers that minimise water use and the discharges to sewers.

The Water Industry Commission's detailed implementation of these principles can be viewed in its Final Determination of Charges for 2015 – 2021 at: http://www.watercommission.co.uk/UserFiles/Documents/Final%20Determination%20-%20Final.pdf

In Scotland, the household sector pays for the costs of the water services provided to it. The average price paid by domestic billed property is £346/year in 2015 – 2016. In setting water charges for households, Scottish Ministers balance a number of public policy considerations. It is our established practice to take account of ability to pay, as permitted by the social and economic provisions of the Directive, by charging households on a flat rate basis linked to local taxation. As Scotland is generally a water rich country it is believed that the lack of direct fiscal incentives on individual households to conserve water will not compromise the achievement of the objectives of the Directive. Furthermore, national publicity campaigns to encourage households to conserve water are carried out regularly through press and TV advertising and the Climate Change (Scotland) Act places a duty on Scottish Water to promote water efficiency. Metering trials are underway to gain the better understanding of water usage in the home so that water efficiency measures can be better targeted.

These matters will be kept under review, as part of the regular round of reviews of water charging policy. This approach will be revised if required in light of experience.

Promoting efficient water use across the environment

As part of an integrated approach to water management, a number of steps have been taken to encourage efficient water use across the whole water environment.

Firstly, the new control regime, introduced in 2005, requires the prior authorisation of any activity likely to have an impact on the water environment. The regime requires operators to take any action necessary for the delivery of our environmental objectives, in line with the impact of their activity on the environment, which reflects the polluter pays principle. This regime is the key tool for delivering the programme of measures.

The regime is risk-based and encourages operators to minimise any impact on the water environment. One key requirement of authorisation is the duty for the authorised person to take all reasonable steps to secure efficient and sustainable water use.

SEPA, before authorising any controlled activity, must assess what steps may be taken to ensure efficient and sustainable water use, and may impose conditions to ensure such use. For example, SEPA has required the metering of volumes abstracted from the water environment where considered appropriate.

As SEPA's evidence of the ecological impact of abstractions of individual water bodies increases (a result of its monitoring programme) it will continue to take further steps to encourage efficient water use in those water bodies. This will be particularly important if areas prone to drought are identified, either in the short- or in the longer-term as the result of climate change.

SEPA has put in place a charging scheme to recover the costs of Scotland's implementation of the Directive, directly linked to the regime described above. This charging scheme reflects polluter pays principles; and applies to all those activities requiring authorisation, except those considered to pose a very low level of risk.

Key principles of the charging scheme are as follows:

- It aims to allocate costs fairly across all water users, including industry, water service providers, and agriculture.
- It focuses upon activities that are likely to have the greatest impact on the water environment.
- It provides an exemption from charging for those delivering an environmental service.

SEPA has proposed a new charging scheme that will come into effect in April 2016. Designed to build upon the strengths of the previous scheme, it will provide the following more powerful financial incentives to drive good environmental practice by operators.

- The annual charges for operators will be determined by the size of the environmental footprint of the activity.
- Discharges to the environment: the charge is determined by the pollutants discharged over the previous three years. This means that discharges with high levels of pollutants will face higher charges. If operators reduce the level of pollutants discharged then their charges will fall.
- Abstractions: the charge is determined by licenced volume abstracted modified by factors which take account of whether the abstracted water is returned, and if it is, the distance

downstream that it is returned. This provides an incentive for operators to reduce the licenced volume abstracted and free up water resources that otherwise would be held by the operator.

- Impoundments: the charges are based on the volume impounded.
- Engineering activities: the charges are based on the type of activity proposed. Higher risk activities face higher charges.

The proposed scheme will also introduce strong financial penalties that will apply if an operator does not comply with the conditions of their authorisation. SEPA proposes to progressively increase the strength of these penalties.

The risk-based control regime, together with the risk-based charging scheme described above, make a significant contribution to the delivery of the stated environmental objectives. Together they provide adequate incentives to ensure efficient water use, and to minimise resource and environmental costs. Both the control regime and the charging scheme are kept under review and revised if required in the light of experience.

Conclusion

Water pricing policies can act as an additional incentive for water users to use water efficiently. A number of policies have been incorporated into the integrated water management programme, with a view to ensuring that the environmental objectives can be met in a proportionate and cost-effective manner, while having regard to the polluter pays principle. The effectiveness of these measures, as with all others described in this plan, will be kept under review.